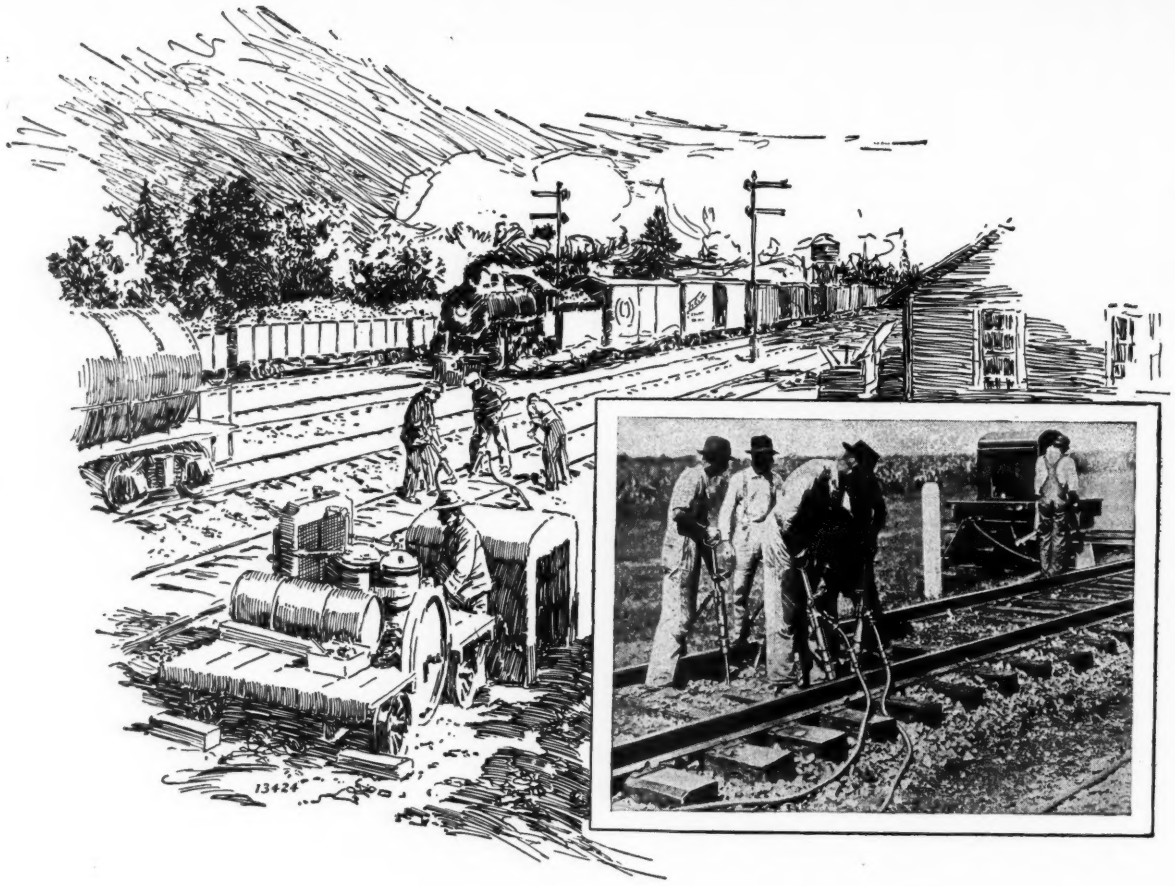
Railway Maintenance Engineer

Volume 18 CHICAGO—SEPTEMBER, 1922—NEW YORK Number 9



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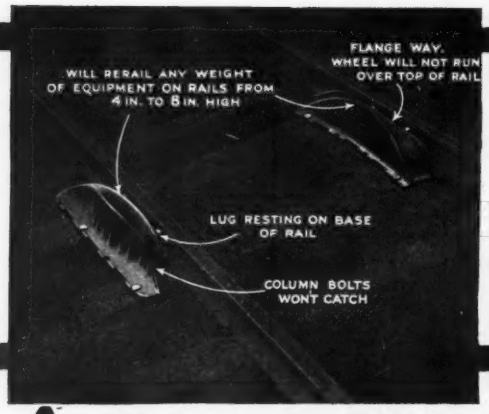

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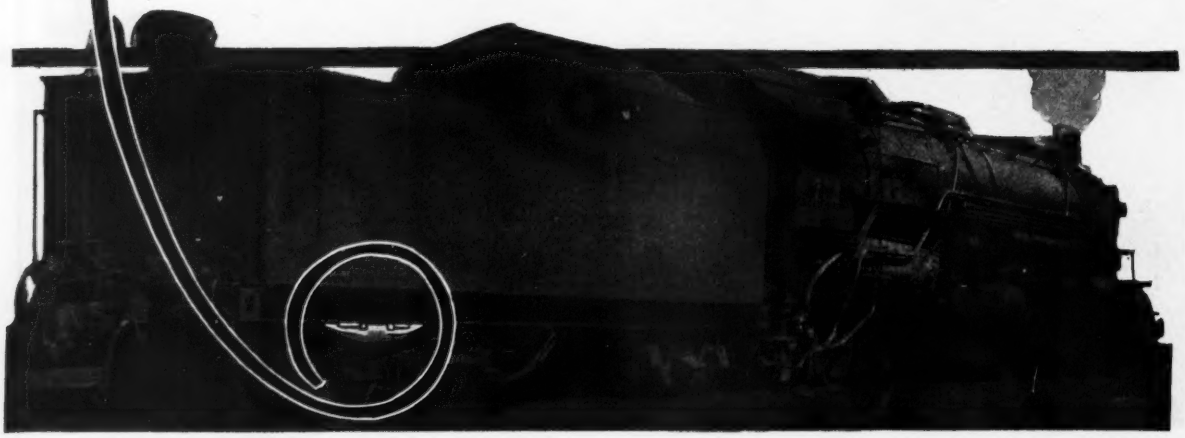

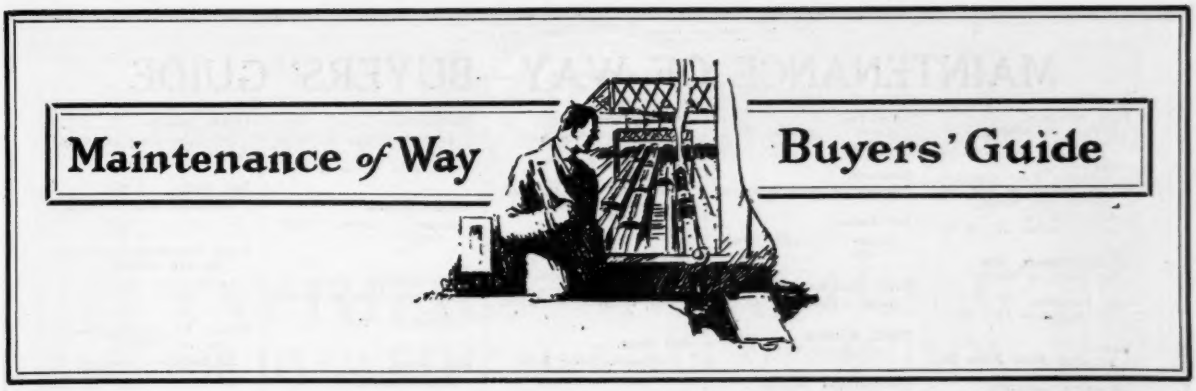

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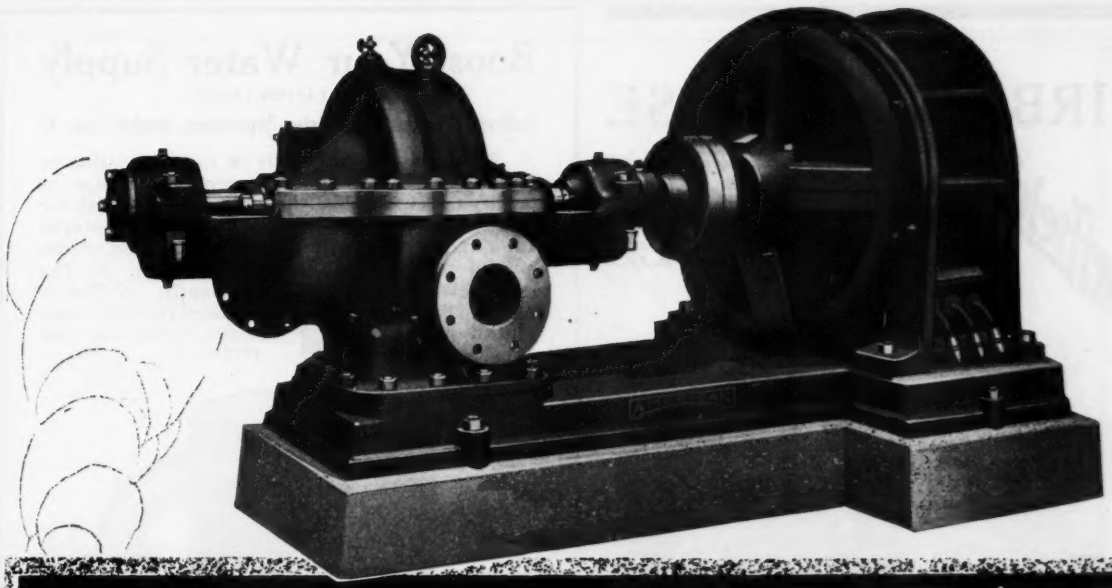

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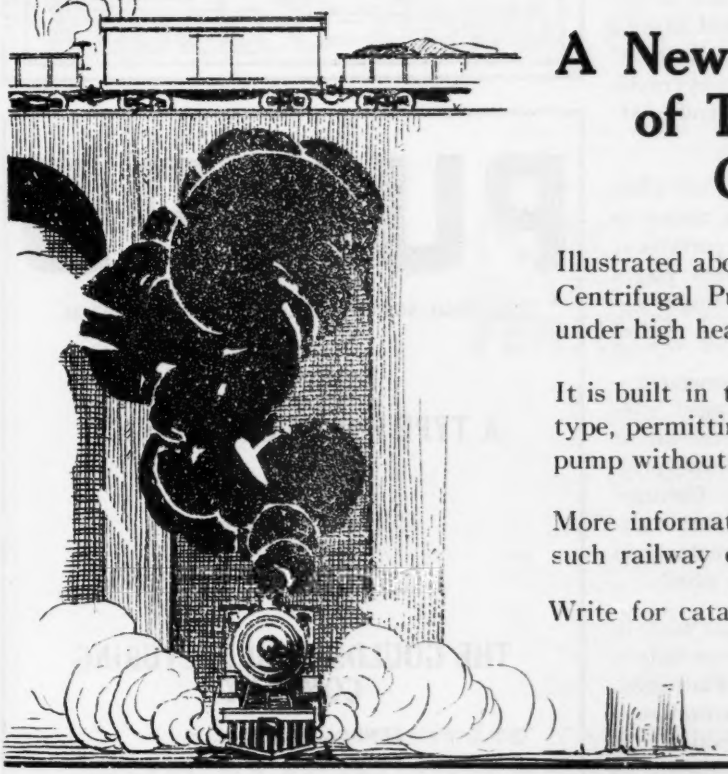

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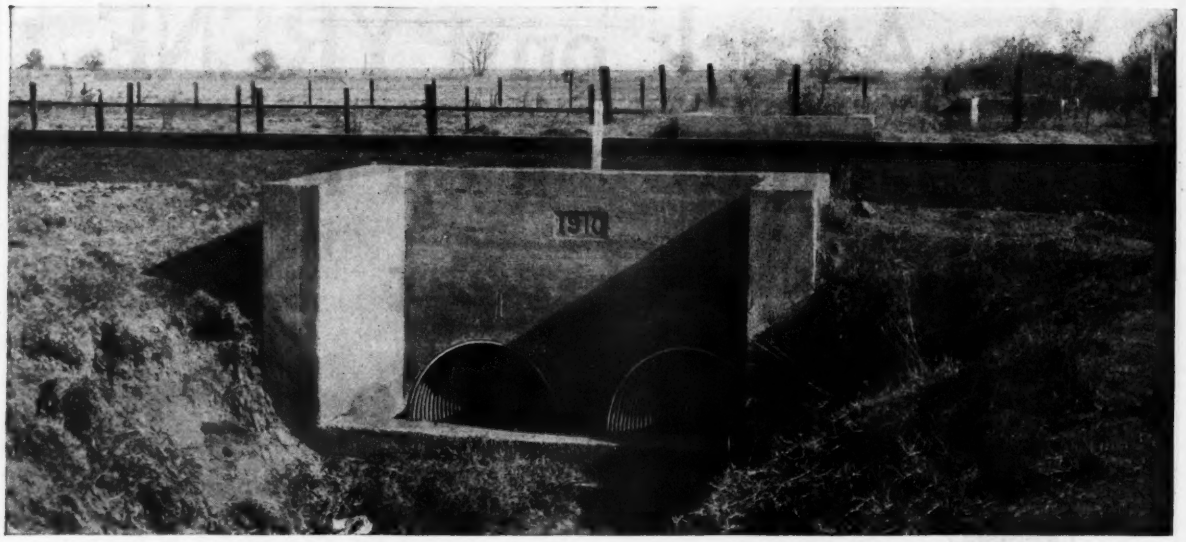

THE RAILWAY ENGINEER who designed this structure showed his faith in the lasting qualities of ARMCO INGOT IRON for culvert service when he inscribed the date of installation—1910—in the end wall.

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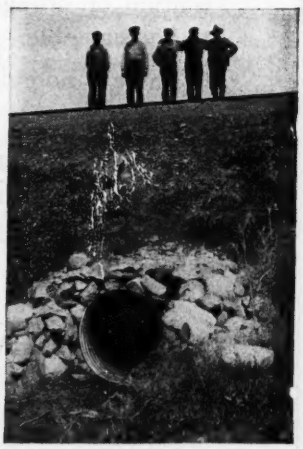

ARMCO Ingot Iron Culvert, 12 gauge, 36", installed 1910. In perfect condition when photographed—May, 1922. Under an 8-foot fill.

Railway Maintenance Engineer

Vol. 18 September, 1922 Number 9

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How to move a water tank on cars?

How many ties were treated last year?

How to build good highway crossings?

What you can do to save coal?

If cypress piles can be treated?

Answers to these and other practical questions will be found elsewhere in this issue

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(With which is incorporated the Engineering and Maintenance of Way Edition of the *Railway Age* and *Railway Engineering and Maintenance of Way.*)

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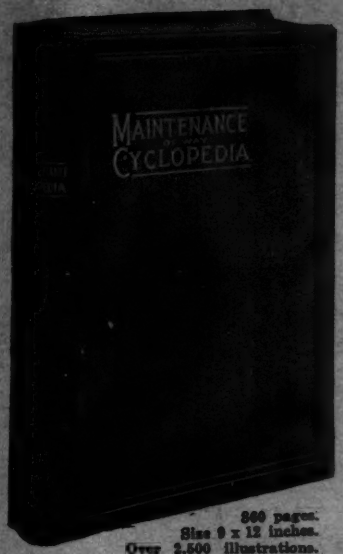

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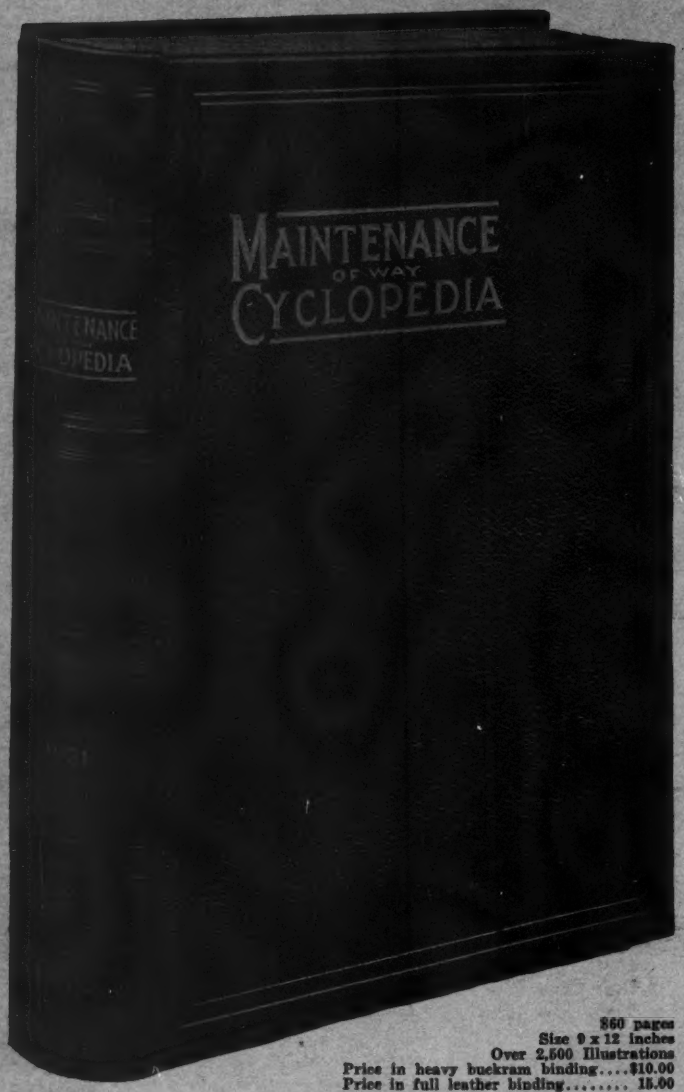

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Railway Maintenance Engineer

Economies Through Use of Motor Cars

It is only in recent years that the real value of the railway motor car in maintenance work has begun to be realized. It is doubtful whether many men have appreciated the full savings in costs that the use of motor cars actually created. Nearly all who have used or have come in contact with this mobile piece of equipment have appreciated the ease with which they or their men have been moved from place to place and the consequent lessening in the more arduous duties of track maintenance. Some have realized that this factor has resulted in an increased output per gang but only a few have made a detailed study of every possibility. Elsewhere in this issue there is an article discussing the economies which some of the railroads have effected through the use of motor cars. The points which are most striking are that the number of sections has been materially reduced and that from one-half hour to one hour per man per day is saved. The economies thus brought about vary on different roads, ranging from $90 to over $1,000 per car per year. If anything can provoke serious consideration of economies via the motor car route for roads which are not using them to any extent, these figures should.

The Rehearings Are Now Under Way

On August 28 the Labor Board commenced hearings on cases taken before the board by the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers, looking toward advances in wages for various classes of employees in the maintenance of way department on a number of railroads. These cases have grown out of the suggestions made to President Grable of the Brotherhood by Chairman Hooper of the Board, just previous to the calling of the strike by the shop crafts. In answer to representations by Mr. Grable that the cost of living had not been reduced as much as was contended in supporting the recent cut in wages, Mr. Hooper replied that the board was always ready to hear any new evidence bearing on this question and acting upon his suggestion, new cases relating to the wages of maintenance of way employees have been brought before the board in what amounts to a rehearing of the recent wage decision. While it is impossible at this time to predict the outcome of the cases now being heard, the maintenance of way organization is to be commended for following this procedure, which is strictly in accordance with the letter and the spirit of the law.

Prepare to Do Without Cars

With many of the coal mines resuming operation and the grain handling season approaching its crest, the indications are that the demand for cars will soon far exceed the supply. It will then become necessary to restrict their use in company service to the most necessary operations. Thus forewarned, maintenance officers should see that all of the materials essential for their forces are moved as rapidly as possible in order that their gangs may not suffer later for lack of them. While it is a handicap to maintenance and construction forces to deprive them of cars when they are sorely needed, it must be remembered that a railway is built to transport passengers and freight and its income is derived almost solely from this source. It is, therefore, important that it haul all of the revenue traffic possible when it is waiting to be hauled. Furthermore, a railway owes a duty to the shipping and traveling public to move this traffic when offered; its own needs must give way to those of its patrons. Therefore, it is in the interest of all that maintenance materials be moved as rapidly as possible now, in order that the inconvenience which will arise when cars are no longer available will be as limited as possible.

Seeing How The Other Fellow Does It

No man can progress far today by his efforts alone. He makes the greatest strides who gathers from his associates knowledge to add to that he already possesses. To do this he must bring himself into contact with those of like experience. The duties of the average maintenance man tie him so closely to his division, sub-division or section that he has little opportunity to meet with others and exchange ideas with them. His viewpoint is limited to the confines of the territory under his charge. If he is to keep pace with current developments he must, therefore, make a special effort to enlarge his viewpoint at every opportunity. Subordinate employees owe it to themselves to utilize every chance to broaden their experience by such contact with others. Supervisory officers should stimulate this practice whenever possible. One division engineer assists his roadmasters and foremen in planning such trips as they take so that they may see the maximum amount of track on the other roads. Instead of restricting these men to transportation over their own lines he urges them to travel over foreign roads as much as possible, and in order to stimulate observation he requests each man who makes such a trip to prepare a report on what he has seen. Such practice may be adopted elsewhere to good advantage.

One Half The Crossties Are Treated

As reported elsewhere in this issue, the number of crossties treated in 1921 was 55,383,515, or approximately half the total number of ties used by the railroads in that year. Thus timber preservation has not only made a marked recovery from the slump which it suffered during the war period, but, measured by the number of ties subjected to preservation, there has been an increase of 23 per cent over the record of any previous year. This is not only an encouragement to those who have long urged the greater use of treated ties by the railroads but is also distinct evidence that the managements of the roads are developing a keen appreciation of the economic advantages of this practical method of increasing the life of ties. Unfortunately, there are no accurate statistics available concerning the aggregate number of ties used by the railroads annually, consequently there is no ready means of checking the results secured by the railroads of the country as a whole in consequence of the greater use of treated ties. However, there have been ample

demonstrations from the results on individual roads to justify the confidence which the managements are now placing in the practice of preserving timber.

MORE TON MILES PER MAN HOUR

THE RAILWAYS of the United States and Canada lead the world in the efficiency with which they are producing transportation. Their rates for the movement of freight are the lowest in the world for equivalent service. This has been made possible by the large number of passenger miles and ton miles produced per employee. It is the primary result of larger engines and cars, low grades, and other improvements. Yet the activities of every department have been coordinated to this end. Bridges have been strengthened for these loads, track has been built and maintained to higher standards, passing tracks have been lengthened, etc.

The development of our transportation system can continue only as the amount of the railways' finished product (passenger miles and ton miles) per employee continues to increase. This result can be achieved only through the greater use of labor saving machinery, by means of which each man can do more work with the same or less exertion. A recent canvass of a large number of maintenance of way officers revealed their almost unanimous opinion that the pressing need of the maintenance of way department is more equipment of this character. A comparison of the methods of today with those of a quarter century ago would reveal the marked progress which the roads have made in the development and utilization of labor saving equipment. At the same time the maintenance of way department has lagged behind most of the other branches of railway service in this direction and there is much development still to be carried out. While it may be considered in some quarters that this development work is the function solely of the railway supply companies, the greatest improvement can be effected only if railway men concern themselves directly with the development of equipment designed to their needs and also cooperate fully with manufacturers in the testing of their equipment under actual service conditions.

Equipment of this character can be justified only on the basis of the savings which it will effect. These savings accrue to the benefit of the railways who can therefore afford to cooperate in converting every meritorious idea into a reality. The development of equipment of this character has lagged of late years because of the lukewarm attitude of railway officers. This has been a handicap to the manufacturers who have been endeavoring to foster such developments but has proven of even greater loss to the roads. The extent to which the development of labor saving equipment will progress in the future will be in direct proportion to the interest which railway men will take in this work.

OUR RAILWAYS

The United States is more dependent upon railroad transportation for its existence than any other country in the world. With only 6 per cent of the world's population and 5 per cent of its land area, the United States has between 35 and 40 per cent of the world's mileage.

American railroads have led the world in the mechanical and technical advancement of transportation. Together with the present-day powerful engine, we have developed the heavy capacity freight car, carrying 50 to 100 tons or more. The combination of the two has made possible the long, heavily loaded American freight train, traveling great distances and producing the most efficient large scale transportation service ever known.

To accommodate such trains, we have rebuilt our tracks and bridges to sustain safely a greater traffic burden than is carried by the railroads of any other country. In short, here in the United States we have transformed railroad transportation from a small-scale localized service into a service of national and continental scope, playing an indispensable part in practically every activity of our people. If for any reason railroad progress in this country should be permanently checked, the progress of our industries will be checked also, because the rate of production possible to our industries is limited to the capacity of the railroads which serve them.—From a statement by Samuel Rea, president, Pennsylvania System.

"HE WAS A PRETTY GOOD DUTCHMAN AFTER ALL"

IN summing up the ideas which have governed him in his relations with the farmers along his track, a section laborer on a western road stated recently in a staff meeting that when he died he wanted the farmers to say that "he was a gretty good Dutchman after all." In these few words he expressed the essence of cooperation and neighborliness, for the railway is the neighbor of all the farmers whose property adjoins its right of way and the maintenance of way forces are the representatives of the railways in the consideration of their problems as neighbors. A railway and the adjoining farmers have more than the usual number of problems of neighbors and the section forces have a greater opportunity to cultivate or to antagonize and thereby to promote or to injure their road than the employees of any other department.

Friendly relations are promoted by the proper maintenance of fences, farm crossings, drainage, etc. By giving proper attention to these matters a railway will benefit in many ways. The farmer who is on friendly relations with the section foreman will be more willing to move his grain back from the fence and to plow fire guards, thereby reducing the risk of claims. He also will be slower to file claims for minor losses. Furthermore, and this fact is often lost sight of, the farmer is a shipper of no small consequence and the routing of his traffic will be determined more by his attitude towards the road than by any appeal which traffic representatives may make. No section foreman can afford to overlook the opportunity to serve his road by cultivating his farmer neighbors and maintaining friendly relations with them. Furthermore by following this practice his own work will be simplified and made more pleasant.

THE CONVENTION SEASON

THE fortieth annual convention of the Roadmasters and Maintenance of Way Association will be held in Cleveland, Ohio, on September 19-21. The American Railway Bridge and Building Association will meet in Cincinnati, Ohio, October 18-20. The members of the Maintenance of Way Master Painters' Association will be invited to attend the convention of the Bridge and Building Association in the absence of a meeting of their

own this year. These two conventions will therefore be of live interest to all those in direct charge of the maintenance of railway tracks and structures.

The maintenance of way officers are working under unusual handicaps this year. Many of them have been detached from their regular duties entirely or in part for several weeks. They are facing the close of the active season with a large amount of work still to be done. First thought would, therefore, appear to indicate the advisability of their remaining on the job. Yet the reverse is true for greater progress will be made by the alert man as the result of attending the convention for a few days and utilizing the opportunity to exchange experiences and opinions with the several hundred men engaged in similar work who will be there. Such a contact cannot help but give the man new ideas and increased enthusiasm which he can apply to advantage on his return home.

These conventions come but once a year and advantage must be taken of them when they come. The meetings this year are at central points where the largest number can attend with the minimum loss of time. Neither association has missed a convention in the 40 and 32 years respectively of its existence. During the war when everyone was straining to the limit to win the struggle the Railroad Administration recognized the value of these meetings and urged as many to attend as could be spared from their work with the result that these conventions were the most largely attended and the most valuable in the history of the associations. This year's meetings should be equally valuable and the present conditions should stimulate rather than detract from the attendance.

THERE IS NO ROYAL ROAD TO SUCCESS

A MAN is picked from the ranks to occupy the position of foreman because he has a thorough first hand knowledge of the work to be done and an ability to direct others. Of course he must possess those elements of character which are demanded of anyone who occupies a position of responsibility, but the two items mentioned above are absolutely essential.

The same principle holds true for the supervisory and other higher positions—there is no substitute for actual experience as a workman in a trade. It is true that certain individuals possess a power of observation which enables them in a large measure to compensate for a lack of actual experience and of course many railway officers have been appointed to positions of responsibility who never served either as foreman or supervisor, but this was done because they possessed certain special knowledge which made their services valuable to the railroad company in spite of the fact that they lacked certain basic training. Moreover, there is no question but what all of these men at some time or other in their carrers have had occasion to regret that they had been denied the opportunity for genuine practical training. An unusual illustration of the importance with which this elementary training is held by men in responsible positions is brought out in the experience of Howard G. Kelley, president of the Grand Trunk as noted on another page. After working for three years in various engineering positions of considerable responsibility Mr. Kelley devoted the next three years of his life to working as a laborer and foreman in order that he might learn the details of two important crafts related to the building of railroad bridges. While few other men who are now the presidents of railroads have taken such drastic measures to obtain practical experience there is not one of them but who is thoroughly convinced of the basic value of knowledge thus gained. Learn to do by doing.

Letters to the Editor

ANOTHER ADVOCATE OF DATING NAILS

Rochester, N. Y.

To The Editor:

I have noted with much interest an editorial in the *Railway Maintenance Engineer* issue for July, entitled, "The Use of Tie Dating Nails," with special reference to the practice on the Santa Fe. We installed a timber preserving plant at Bradford, Pa., in 1910 to treat our ties and bridge timbers. Since the beginning we have made a practice of inserting a nail in each tie indicating the kind of timber and a nail indicating the date placed in the track, and have a complete book record of approximately 1,600,000 treated cross ties and switch ties now in the track.

Last year, in view of our complete record covering a period of 12 years, we considered the advisability of discontinuing the nailing of treated ties, but after studying the matter from all points of view we decided to continue the practice, the thought being that the psychological effect on the foremen who have been trained to respect a tie bearing timber and dating nails will more than offset the expense involved. E. F. Robinson,

Chief Engineer, Buffalo, Rochester & Pittsburgh, Rochester, N. Y.

THE STORAGE OF GASOLINE

Kansas.

To The Editor:

My attention has recently been called to the storage of gasoline for motor car use. When cars of this class were first placed in service the question of gasoline storage arose and homemade timber boxes of sufficient size to house a 50-gal. drum were located at 20 or more points on a division of a certain road.

To show how costly this method is I will refer to the procedure of the engineering department, which maintains two motor cars on this division. The storage box serving these two cars is located 300 ft. from the motor car shed on a knoll about 6 ft. above the track and 80 ft. distant. When starting with a car the three men push it out on the main line to a point opposite the storage box. One man guards the car and two proceed to draw gasoline, for which purpose they use a tin suction pump with a six-foot stem. One man holds the stem in the bung hole of the drum while the other operates the draw. When the five-gallon can is filled, often with the unavoidable spilling of some oil, one man returns to fill the tank on the car while the other takes the pump back to the motor car shed. Under favorable conditions this operation takes about 45 min., and the cost of drawing five gallons of gasoline is $1.98. Under unfavorable conditions the cost may greatly exceed this. For instance after a night of rain the storage pit fills with water, requiring the party to spend two hours bailing it out before drawing the gasoline.

This railroad profits from its practice of saving spikes worth only a few cents a pound and using them over again, yet it tolerates an appalling waste of oil and gasoline costing from 18 to 30 cents a gallon! This waste is avoidable. By replacing the gasoline drums and oil cans with proper steel tanks and by using measuring pumps the waste caused by leakage, dripping spigots, and lack of an accurate check on consumption can be eliminated.

An Observer.

The Bois Reservoir

Illinois Central Improves Its Water Supply in the Coal Fields

Effect of Summer Droughts in Southern Illinois Overcome by Additional Facilities

DURING the last few years the Illinois Central has made a number of improvements in the water supply in the vicinity of the coal fields of southern Illinois, which have solved a serious operating problem at a relatively small expenditure. A series of annual water shortages had been encountered which were sufficiently acute to require the hauling of water in trains for considerable distances at much expense. This condition not only seriously interfered with the orderly and economical movement of traffic but threatened production of the mines in the vicinity. A program was therefore launched in 1918 which involved extensive alterations at several water stations and the installation of a new pumping station. The work involved a total expenditure of approximately $240,000, as a result of which the region is now adequately protected against trouble from this source for several years to come.

The lines under consideration extend from Centralia, Ill., on the north, to Cairo on the south, passing through one of the largest coal producing fields west of the Alleghenies, with numerous branches and an extensive switching service.

This is a region in which the subsurface water contains such a high content of scale-forming salts as to warrant its use only as a last resort. It is also an area in which the few streams carry much suspended matter and are otherwise more or less undesirable for use because of pollution from mine drainage. As a result it had become a practice for the railroads in this vicinity to obtain their supply from surface reservoirs of their own construction or the property of neighboring towns. The topography of the country lends itself to this purpose and these reservoirs have invariably afforded supplies of very satisfactory quality for locomotive use. Unfortunately, however, the region is subject to protracted periods of dry weather. This condition, in the face of the heavier demand for water by the municipalities precipitated a situation in which the railroads in that vicinity were confronted annually with a threatening or actual shortage of an increasingly serious nature.

Of the several points on the Illinois Central where trouble was encountered, the situation was most acute at DuQuoin, 35 miles south of Centralia. This is a junction point between the main line and the line to St. Louis. The supply at this point was obtained from a reservoir whose capacity had been outgrown by the demand. It was a regular occurrence for it to become exhausted about September 1, and it would remain so until about the first of the year, either because there was no water available or because of the freezing during the winter of what little water remained in the reservoir.

Railroad Required to Haul Water.

As it was essential that a supply be maintained at this point it became necessary to haul water in cars from Carbondale, 20 miles south, or from a branch line station at Sand Ridge, a distance by track of about 50 miles. As an indication of the acuteness of the shortage it was not unusual for as many as three trains of 20 cars each to be operated daily to serve the one station, and during the months of November and December, 1917, and January, 1818 (the most difficult time of the year to haul water) as many as 3,000 cars of water were hauled to this point and emptied into the reservoir. This was an expensive procedure, the cost of hauling water to the one station, in fact, exceeding $25,000 in 1917, exclusive of rentals and maintenance of equipment. Moreover, these trains seriously interfered with the normal operation of regular traffic and because of the impossibility of hauling the water in ordinary tank cars at that season of the year because of weather conditions, the situation required the use of coal cars at a time when these cars were in the greatest demand at the mine.

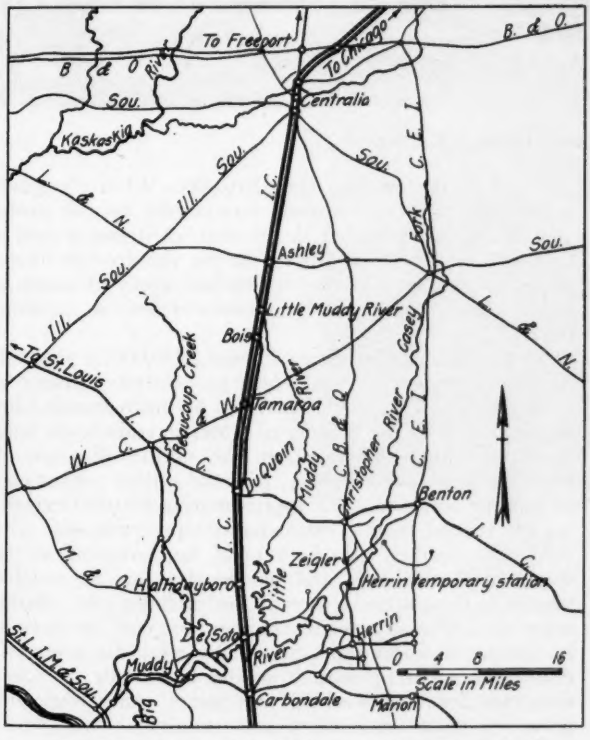
An unsatisfactory situation also existed at Bois, midway between DuQuoin and Centralia, where the supply was obtained from the Little Muddy river and from an impounding reservoir of approximately 50,000,000 gal. capacity. While the reservoir water was entirely satisfactory in quality and the river water of fair quality, and while no shortage had actually occurred at this point up to the time the water supply program was undertaken, the creek could not be relied upon for the required supply during more than three to six months of the year, during a part of which time it also carried considerable matter

A Beautiful Spot

in suspension. Neither could the water shed be relied upon to keep the reservoir filled to its capacity. In addition the old pumping plant had become inadequate to handle properly all the water required during normal times, not to mention the period when a shortage was encountered at other points, particularly at DuQuoin.

Carbondale Important Point

The situation at Carbondale, a station further south on the main line, presented another aspect to the problem than that of shortage. Situated 30 miles south of Hallidayboro and at the junction of the main line with the



The Lines of the Illinois Central in the Coal Area

coal branches, where it was customary for all trains to take water and where as many as 1,500 cars of coal a day were received from the coal producing section, this station was one of the most important on the system. To meet the demands made upon it, water was pumped from a steam plant on the Big Muddy river, 4½ miles west of Carbondale, through three miles of 8-in. cast iron pipe and one mile of 12-in. pipe to service tanks at the roundhouse and in the yards having a total capacity of 100,000 gal. Aside from a little trouble occasionally encountered by the pipe line being too small, this supply was adequate at all times for the demand made upon it, but the quality of the water was bad. As suggested by its name, the Big Muddy river carries large quantities of silt at certain seasons of the year but in addition to this it also carries matter in solution ranging from 1 to 7 lb. per 1,000 gal. of which from 1 to 5 lb. is scale-forming solids. Because of this, considerable trouble from leaking of flues was encountered during low water periods, by reason of which it became advisable at such times for trains to take water at less advantageous points from an operating standpoint.

Influence on Mine District

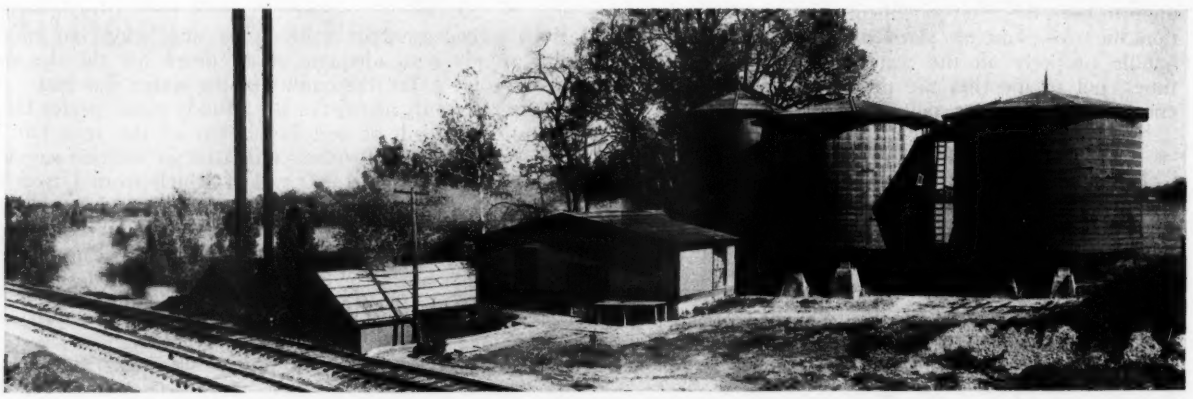
The Illinois Central maintained no water stations in the vicinity of the mines tributary to its tracks, but depended for its supply upon the towns of Christopher, Benton, Herrin and Marion. All of these towns were supplied from inpounding reservoirs. With the normal increase which had taken place in the population of these towns, as well as the increased demand for water made upon them by the mines and the railroads, it had become a regular thing for the towns to suffer from water shortages during the late summer and early fall, and when these shortages occurred it became necessary for engines to run for water to DuQuoin or Carbondale, the average distance ranging between 3 to 12 miles each way. With the interruption to the regular operation of trains by reason of this continual running for water during uncertain seasons, together with the facts that the supply at Carbondale was anything but satisfactory, that the supply at DuQuoin was obtained only by hauling water from other points; and that there was a tendency for the shortages of water purchased from the towns to increase with the growth of the demands made upon them, the situation was becoming a serious one.

A New Reservoir Provided

At DuQuoin, where about 75 per cent of the shortage occurred, it was not possible to overcome the difficulty inexpensively. With no creek at this point and with the poor quality of the ground water eliminating it from consideration as an auxiliary supply, only two alternatives remained; one, that of deepening the existing reservoir and the other of building a new one. An investigation revealed the fact that even if the deepening of the existing reservoir was not prohibitive in cost there was no assurance that when once deepened the water shed could be relied upon to provide the additional water. It was decided, therefore, to build an additional reservoir and to replace the old pumping plant. The new reservoir was constructed in a valley adjacent to that in which the

old reservoir was located. This required the construction of a dam at an expense, along with other details, of about $128,000. Supplementing this, a new pumping plant was built which consists of two 25-hp. semi-Diesel engines, belt connected to two 500 gal. per minute centrifugal pumps. In addition the six-inch pipe line was replaced by one and a half miles of eight inch pipe line, salvaged from improvement work at Carbondale, and a 100,000 gal. service tank was erected to increase the track storage to 190,000 gal.

At Bois, as has been mentioned, the water supply was obtained from a stream that could be relied upon for an adequate supply only about six months in the year and from an auxiliary reservoir, having an insufficient draining area. The problem, therefore, was one of increasing the water supply. The solution at first appeared to be one of enlarging the impounding facilities and at the same time increasing the watershed, a work which would require the constructing of a second dam across the main valley below the main reservoir and the purchasing of a large tract of land for a reservoir site, at a cost ranging anywhere from $100,000 and $150,000 over and above the cost of increased pumping facilities. In working up the plans for the new pumping station, however, the idea was conceived of so arranging the plant that the old reservoir could be filled from the stream during its high water period and then held in reserve for the period when a supply could no longer be obtained from this source.



The New Treating Plant and Pump House at Carbondale, Ill.

New Facilities at Bois

Working on this basis, the old steam plant was replaced by a new plant, which as at DuQuoin, consisted of two 25-hp. semi-Deisel engines, belt connected to two 500 gal. per minute centrifugal pumps arranged in duplicate and capable of pumping against 100 ft. head. In addition to this the six-inch line to the reservoir was replaced by a 10-in. line, an additional storage tank was provided and a water column shifted to a more advantageous location. Although this work involved a total expenditure of only $30,000 approximately, it has proved entirely adequate for the purpose, the creek affording a certain supply until about September after which the reservoir can be relied upon for a period of from four to five months. As indicating the economy of this plan over the original one of providing a new impounding facility, approximately 30,000,000 gal. of water was pumped into the reservoir from the creek at a cost not exceeding $150, while if the additional storage and water shed had been provided the interest and depreciation expense alone at six per cent would have been anywhere from $6,000 to $9,000 annually.

Having remedied the situation at DuQuoin and Bois it was found unnecessary to make immediate changes at other points on the main line, other than at Carbondale where the facilities for handling the water were increased by replacing three miles of 8 in. pipe with a 12-in. line and installing a water treating plant to remove the incrusting solids and suspended matter from that water. The total cost of the latter project approached $68,000.

Temporary Plant on the Little Muddy

This having been done, the development was completed by building a temporary station at a point about midway between Herrin and Ziegler on the Little Muddy river. At this point the river is above the principal mine drain inlets and affords a water seldom exceeding 1½ to 2 lb. of encrusting solids per 1,000 gal. as compared with 5 lb. at Carbondale. The equipment at this point consists of a steam plant of two 45-hp. boilers and a 50,000 gal. tank, constructed from material salvaged from other points at a cost not exceeding $16,000. While this plant is not located as conveniently as could be desired to the switch engines operating in this district it has proved a boon not only to the railroads in the vicinity but to the mines as well, by affording a suitable supply of water at times when it could not be obtained from the adjacent towns.

At a total cost therefore of about $240,000, a program has been carried through which has entirely eliminated a recurring condition characterized by much running for water as well as the hauling of water in train loads with the interruption it entailed to the normal dispatch of trains as well as its expense, the total out of pocket cost of hauling water in 1917 approximating $40,000 excluding the cost of rentals, maintenance equipment, etc. The work has resulted also in a great improvement in the water at Carbondale, and has worked an appreciable benefit to the company directly and indirectly by eliminating any necessity for curtailment in coal production by reason of water shortage and by affording a considerable source of revenue from the actual sale of water to mines for coal washing and steam generating purposes.

To indicate the magnitude of this business, during one month 111 tank cars of water were furnished to the mines from the new station at DuQuoin, 85 from Colterville, 118 from New Athens and 7 from Carbondale, all in addition to the 838 cars from the Herrin-Ziegler pumping plant.

These improvements were designed and undertaken under the direction of F. L. Thompson, chief engineer, A. F. Blaess, engineer maintenance of way and C. R. Knowles, superintendent water service, Illinois Central.

Can You Do the Work That You Expect Others to Do for You?

President Kelley of the Grand Trunk Once Found This So Important That He Spent Three Years in Learning Two Trades

By Walter S. Lacher

WHEN THE executive officers of the Grand Trunk were looking for a chief engineer in 1907, they selected Howard G. Kelley, who was then the chief engineer of two small railroads, the Minneapolis & St. Louis and the Iowa Central. That the selection was not an unwise one is indicated by the fact that Mr. Kelley demonstrated his ability so fully that he was later elected to the presidency of the road, a position which he now holds.* This raises the question as to the considerations which prompted the officers of this great Canadian railway system to pick its chief engineer from a little known property in the middle western states.

It is of vital interest to every man on a small road to ascertain how he can fit himself for responsibilities beyond the scope of his present opportunities. In the case of Mr. Kelley, the limited finances of the roads on which he had been employed necessarily confined the exercise of his engineering skill to the solution of problems requiring the exercise of the strictest economy and to the direction of projects which did not afford opportunity for a demonstration of unusual executive ability. In other words, there was no opportunity for spectacular performance.

Howard G. Kelley,
President, Grand Trunk System, September, 1917, to August, 1922

Facts concerning the actual circumstances attending the suggestion of his name to the officers of the Grand Trunk are not at hand. Indeed, they are immaterial. It suffices to suggest that his participation in the activities in the American Railway Engineering Association afforded the necessary extension of his horizon. From a rather obscure part in the formation of this organization in 1899 and 1900, he rose to its presidency in 1905 and occupied that office for two terms.

Conversation with railway officers who had been in close contact with Mr. Kelley over a period of years were fruitful in disclosing personal characteristics which obviously have had a marked influence on his success. He is possessed of a thorough scientific and practical training, and it has been said of him "he approaches any problem from the viewpoint of the engineer, but with the faculty of the thorough railway man for rendering a decision quickly. His attitude is judicial yet thoroughly practical and with an ability to distinguish between what is probable and what is possible."

Like all true executives he seems to possess an ability to dismiss a subject from the mind once it has been disposed of in the business.

"He doesn't take his troubles home with him," said one man. "He seems to be able to enjoy perfect peace of mind during leisure hours, no matter how trying his responsibilities may be."

Another of his associates is impressed with his ability of self-control which enables him to retain full command of himself when others become excited. "I have seen him very indignant at times, but I have never seen him lose his temper," is the way that he expressed it. "I would be very sorry indeed for anyone who tried to put something over on Mr. Kelley," he added, "but I never met a man who observed a more kindly and considerate attitude towards his subordinates and associates, in fact, toward anyone with whom he had dealings."

This last characteristic is emphatically impressed on anyone who calls on him for the first time.

"I am afraid," he said in answer to my request, "That it will be a little hard for me to apply my own experiences to the problems of the young man of today because times have changed since I took up railway work. Conditions are different now. In the early days, the young man in railway service was concerned with location and construction of the roads and in their rebuilding and perfecting for transportation purposes. Today the problems are commercial or economic rather than physical so that if a man wants to prepare himself for railroad work it is not only of distinct advantage to have a technical education but it would be to his interest to amplify this as much as possible with business or economic training."

"Does this training compensate in a measure for experience?" I asked him. "Does it enable a man of excep-

*This article was written before Mr. Kelly resigned, on August 14.

tional mentality who has had one character of experience to adapt himself readily to a position of responsibility in work with which he has no direct training?"

"No, railroad work is of such a character that no man can obtain success through native ability alone. To become an effective executive one must work from the bottom. That rule prevails in my own organization on the Grand Trunk. Every officer moves up step by step as ability is developed. It is the same in all departments. Of course, there are several lines of advancement to operating positions. Among our superintendents you will find men who have served as conductors, dispatchers, agents and division engineers."

"Your own early experience, I understand, was largely in railway construction."

"Yes," he replied, "construction was the big thing in those days, especially in the far West. I was graduated from the Polytechnic College of Pennsylvania at Philadelphia in 1881 and went to San Francisco to look for work, but I could find nothing there so I went up to Portland where the only vacant position I could find was that of rear flagman on a preliminary survey party for the Northern Pacific in the Cascade mountains. That was in the early spring. We continued on the work well into the summer when we were caught in floods of the headwaters of the tributaries of the Columbia river due to the melting of mountain snows and for nearly two weeks we slept in ice water as we worked our way out. As a result practically every man in the party became seriously ill from exposure and the party was broken up. In my own case, it meant two months in the hospital and when I got out in September I could scarcely walk, but I immediately reported at our headquarters which were then at Portland and on September 22 I left for Spokane Falls. From there I went by work train to Dry Lake and then on the fifth day out of the hospital I walked 29 miles to Lake Pend Oreille.

"For the next 20 consecutive months I never saw civilization. We were engaged in the location of the Northern Pacific around the north shore of Lake Pend Oreille and up Clark's fork of the Columbia river. During the course of this work I served as rodman, topographer, leveler, transitman and finally 'Engineer in charge of the party.' The construction work which followed was carried on by company forces and I was given charge of the design and the construction of bridges on the Clark's Fork division."

"Few young men who enter railway service today would have any experiences to compare with those?"

"Yes, that is true. In most cases they would be on grade revision, double-track work or yard construction, and in very few parts of either the United States or Canada would they be located very far from settled communities."

"Don't you believe that your experiences and those of the other young men of the same period were better designed to develop a man's character and ability than the environment which the young man in railway service would have today?"

"No, I think not. Human nature has not changed and the requirements for success—perseverance, hard work and the development of a proper mental attitude—can be acquired the same now as then."

"Were your later experiences in the northwest equally adventurous?"

"When the work on Clark's Fork was concluded at the Missoula river, I returned to Portland and after some varied assignments, including a trip up the Yakima river into the Cascades, at the direction of V. G. Bogue, assistant chief engineer at Portland, I was placed in charge of the bridge construction on the Columbia division. Later I was sent to Seattle on a special assignment to prepare a complete map of the water front of the city. This proved a valuable experience to me since I was placed entirely on my own responsibility without direction or guidance from any of my superiors. When this work was completed I went to Tacoma, Washington Territory, to take charge of the field work of the harbor survey and the preparation of the maps. Here my engineering experience came to an abrupt end because a financial depression in 1884 stopped all railway construction.

"Idleness gave me ample time for serious reflection. During the previous three years, I had had some very interesting experiences and valuable training. I had been placed in charge of men on all kinds of construction, but I was compelled to confess that I did not know how to use the tools by which they carried on their work. I realized that this had been a handicap to me so I determined to learn what I could about these trades. I went over into Montana where I was not known and hired out as a workman in a timber gang. At the end of the year I was the foreman of a carpenter gang building all kinds of timber structures. I then concluded that I knew all I cared to know about that class of work so I made another change and got a job as a blacksmith's helper. I wasn't any too large for that kind of work but I think I can say that I was pretty strong, and I held up my end all right. Well, by the end of another year, I was foreman of a blacksmith gang doing all classes of iron work."

"Did you find that this experience was of value to you?"

"Yes, because it enabled me better to judge of the amount of work that could be expected of workmen under various circumstances which, of course, is a very important element in supervising the work of others."

"Your next position I understand was with the Cotton Belt. How did you happen to locate so far from your former associations?"

"When engineering work began to open up in 1887, I decided to look for another position. So I made a trip south and obtained a position as engineer maintenance of way and later in addition superintendent of bridges and buildings on the St. Louis, Arkansas & Texas Railway, which is now a part of the St. Louis Southwestern, and my headquarters were at Texarkana, Tex. About two years later, in 1890, I was made chief engineer of the St. Louis Southwestern, my work at that time consisting principally in the reconstruction of 720 miles of narrow gage to standard gage, the rebuilding and maintenance of bridges, and the construction of considerable additional mileage. The bridge work included the rebuilding of structures over some of the most important rivers of the South in the Mississippi drainage from the west.

"On March 1, 1897, I left the Cotton Belt to go to Minneapolis as chief engineer of the Minneapolis & St. Louis, although I continued for a year as consulting engineer of the St. Louis Southwestern. During the time that I was with the Minneapolis & St. Louis, it acquired the Iowa Central and the Des Moines & Ft. Dodge and we rebuilt these properties and located and built 400 miles of new line in Minnesota, Iowa and South Dakota. During construction I had charge of operation.

"On both the Cotton Belt and the Minneapolis & St. Louis, you were employed on what were then roads of limited resources and as a consequence I assume that you were not enabled to carry out construction work on as large or as permanent a scale as would be the case with some of the stronger railroads. Does this tend to restrict the opportunity of the man so employed?"

"On the contrary, I think the man of a small road has

some advantages in that he has an opportunity to play a larger individual part in the problems that are encountered. I know that I had opportunities to deal with engineering problems that were exceedingly complicated and diversified and as for general experience I can recite one incident that may be of some interest.

"In the spring of 1895, the Mississippi river and its tributaries below Cairo, Ill., were subjected to one of the most disastrous floods in the history of that region and you may be sure that things went hard with the railroads. I was with the St. Louis Southwestern at that time and from April 17 to May 13, while I was out fighting washouts, I was in bed only three times. On the remaining nights if I slept at all it was on flat cars, lumber piles or any other reasonably flat surface that was above water.

"I am not telling you that," he added, "with the idea that I did anything unusual, but simply to point out that in the long run the man in active railway service gets a pretty well rounded experience no matter where he is employed. It is simply a matter of profiting from this experience. The same fundamental principles always apply no matter whether the problem is large or small."

One notable characteristic of railway presidents which seems to be common to them is an apparent ability to meet and deal with each problem brought to them during the day in a frame of mind that manifests a complete dismissal of all other urgent matters with which they are constantly confronted.

"They convey the impression," I said to Mr. Kelley, "that the business of the moment is the only thing which occupies their minds."

"That is true," he answered, "and for a very good reason. We must do our work that way since it is the only way in which we can get it done."

Power Tools Expedite Maintenance Work on Railroads Overseas

PROGRESS in the use of mechanical equipment in track maintenance work in England and France was reviewed in an article by N. M. Clougher before a meeting of The Permanent Way Institution in London, which gives an interesting insight into the character of equipment which has been developed and used, and the nature of the results secured.

Electrical Equipment Favored

Current practice in England and France seems to favor electrical equipment with semi-portable power units. In some cases these are small gas engine generator sets, in other cases steam has been used. One marked departure from American practice is the custom of setting up a temporary trolley wire so that the various power units may be supplied with current by means of a trolley pole which is hung on the wire where needed. The smaller generator outfits are rolled over the tracks on their own wheels and are set off the tracks according

The Machines are Mounted on Little Cars.

to methods employed with similar equipment in this country.

Power operating machines have been used to some extent for tamping ties, boring screw spike holes, turning the screw spikes in and out, for adzing ties and for sawing and drilling rails. One essential difference between these machines and those used thus far in America is that the machines are of such size that they cannot be carried or handled by the operators. Instead they are mounted on small trucks in such a way that the weight of the machine is supported on wheels. The trucks provided for this purpose, however, are made so that they may be taken off the track in about a minute.

Mechanical Tamping

The tamping of ties with the electrical tamper has proven successful in various classes of ballast, including slag, stone and (during the war period) even with mine

Mechanical Tamping in the Orient.

earth. Attention, however, is called to the necessity of using a shoe on the tampers adapted to each kind of ballast. These electrical tampers will deliver 400 blows a minute. The machines are ordinarily operated in groups of four, one on each side at each end of the tie, and these four machines will tamp from 40 to 60 ties thoroughly per hour, or 10 to 15 ties per man hour. However, with this performance it is not fair to make a comparison with hand tamping because the mechanical tamping is much more thoroughly done. The advantage of this tamping as given by the author of the paper is summarized as follows:

(1) The ballast is tamped more firmly and uniformly than is possible by hand.

(2) It is necessary to go over the track only once, instead of

having to come back several times after settling. This in itself is a great saving.

(3) The track seldom settles after tamping.

(4) Normal train speeds may be resumed immediately after the tamping is completed.

(5) The tamping battery can immediately follow the relaying gang, and so the track is completely finished at one time.

(6) There is greater security on curves and generally an increase of public safety.

(7) The tampers have shoes specially designed for each kind of ballast.

(8) As the man does not take the weight of the machine he can feel to a nicety when the tie is fully tamped.

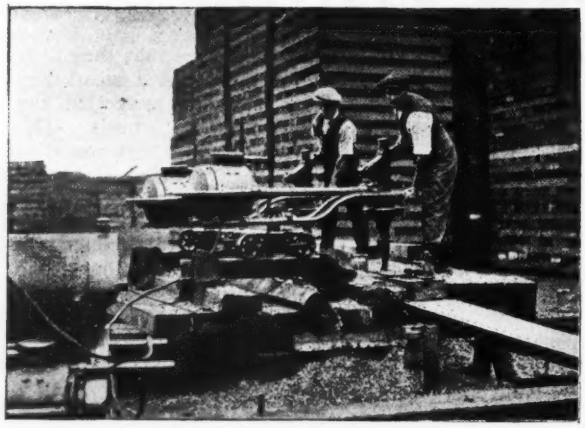
(9) Similarly he can direct the blow where required with great precision.

(10) As the tamping is finished before the passage of a train the tie is not injured by being crushed on to a few sharp points of stone that frequently suffice to support it in the case of hand-tamping.

(11) Under proper conditions this is cheaper than by hand-tamping.

Screw Turning Machine

The extended use of screw spikes in Europe for holding rails to the ties lends considerable importance to machines for boring holes and screwing down the spikes. In the case of the screwing machine, the most important



Boring Ties in the Yard.

consideration, and one which gave trouble for a considerable time, was to avoid carrying the work too far, in other words, over tightening so that the threads formed in the wood are stripped. This has been overcome by tests which determined a maximum twist which the wood fibers can withstand, and then providing the machine with an adjustment such that the power will be shut off at some limiting torsional moment set at a safe margin below the ultimate strength of the wood. In spite of this restriction or complication, the operation of the machine is very rapid. They are also used for removing the screws from the tracks, for which purpose the machines will readily remove 10 screws per minute.

Machines are also used for boring the ties for screw spikes. Sometimes this work is done at yards and at other times the machine is moved over the line on a small car for use where needed. The work of boring is also done very quickly in spite of the fact that the holes have to be set for gage with a template. Work of this kind has frequently been done at a rate of 6,000 holes per day for each machine. This, however, is on the basis of six holes per tie which, of course, is decidedly unlike American practice.

Considerable success has also been had with an adzing machine, consisting of high speed milling cutters operated by an electric motor much like American practice for the same purpose. The paper placed particular stress on experience with this machine in France in the re-adzing of ties in service, both ends of the tie being adzed at one time without removing it from the track. The operation requires only from 5 to 10 sec. and can be made to give almost any type of cut desired. On new ties this machine will turn out from 1,000 to 2,000 ties per day, this production being decreased on old ties in which considerable sand and stone has become imbedded.

Rail Drilling and Sawing

The rail drill, like the other machines, is electrically operated, a motor of the required power being supplied with current from an electric generating set. The machine is carried on a light car, but in this case only one machine is provided, which is set on a pivot at the center, so that either rail may be drilled as required. The drill works at 200 r. p. m. and drills a rail in about 30 sec. In actual practice the output is about 40 holes per hour, or about one every 1½ min., the extra time being taken up in moving the machine, etc. The value is not alone in drilling holes for splice bolts, as it has a very important use in drilling holes for bonding rails.

The need of a new type of rail saw became apparent during the late war, and as a result a readily movable power driven rail saw was introduced for use along the line, and this has met with considerable success. Blades of the hack-saw type are used, and a rail is cut in from 6 to 10 min., leaving a square and clean cut face.

Another development which apparently has no counterpart in this country is a device for loosening ballast that has become thoroughly consolidated. Unfortunately the paper goes into no detail as to the character of this machine, but states that it loosens the ballast very quickly.

New British Rail Specification

THE BRITISH Engineering Standards Association, which is an organization of the Institution of Civil Engineers, the Institution of Mechanical Engineers, the Institution of Naval Architects, the Iron and Steel Institute and the Institution of Electrical Engineers of Great Britain, has just issued a revision of its standard specifications for bull head rails, with revised standard sections for rails weighing from 60 lb. to 100 lb. per yard inclusive. The present specification is a revision of one first issued in 1904 and revised in 1909.

Among the more important modifications are the following:

(1) Two classes of rails are now included, namely, ordinary carbon and higher carbon rails, and separate chemical analysis are specified for the Bessemer and open hearth processes.

(2) The position in the head of the rail from which the drillings and the test pieces for the chemical analyses and tensile tests are to be taken are now defined.

(3) In the drop test the height of the drop for B. S. section No. 90 has been reduced to 18 ft., the use of crop ends is allowed and the measurement of permanent set after the first blow has been omitted. The test is required to be carried out upon the British standard falling weight testing machine.

(4) The range of tensile breaking strength for ordinary carbon rails has been increased from 40 to 48 tons per square inch to 42 to 53 tons per square inch, and a range of tensile strengths for higher carbon rails inserted.

(5) The testing procedure before rejection has been set out in detail.

(6) Provision is made for ascertaining the weight of the rails during rolling.

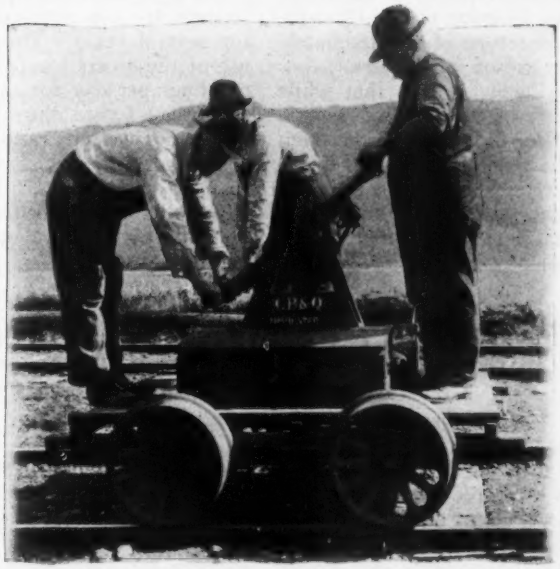
(7) The brand or mark of the Association is now only intended to indicate that the rail is of Brtiish standard section.

(8) An arbitration clause has been included.

The sections have also been modified, the depth of the head of the 85, 90 and 95 lb. rails having been increased by 1-16 in., 5-64 in., and 1-32 in., respectively, with the object of securing a longer life, a corresponding amount being taken off the foot in each case.

Motor Cars Cut Maintenance Costs

Saving in the Time and Energy of the Men Is Gradually Doing Away With the Old Pump Car



The Old Irish Mail Demanded as Much Energy of the Men as an Equal Time at Useful Work

THE RAILWAY motor car has now been in use for about 10 or 12 years, starting with a limited introduction on some of the more progressive roads and gradually spreading until today there are few roads in the country that do not use them to some extent. It is estimated that there are about 50,000 motor cars in service, representing an investment of more than ten million dollars. Their greatest asset has been the saving of time in the moving of maintenance and signal forces and material, with an equally important, though, perhaps, more indirect saving through the elimination of much of the drudgery of maintenance work.

Although many people realize that an actual saving accrues to the benefit of a railroad which uses motor cars, the amounts or even approximations of the amounts so saved have not been known. The following abstracts from reports prepared by western railway presidents for presentation before the Interstate Commerce Commission some time ago, should therefore be of distinct interest. These reports show that in practically every case there has been a marked saving in the hours expended in non-productive travel over sections and sub-divisions, and that it has been possible to reduce the number of sections by extending their limits, thus requiring less labor.

In 1920 there was a total of 963 sections on the Northern Pacific. Since that time there has been a reduction of 103 sections or 10.7 per cent, which involved the lengthening of the sections and was made possible through the use of motor cars. Of the 860 sections, 60 are yard sections on which motor cars could not be used to advantage. Of the remaining 800 sections, 666 are equipped with motor cars. This road feels that the saving in money on account of motor cars is difficult of exact determination. Against the saving in time to gangs and the advantage arising from lengthening sections must be put the cost of maintaining and operating the motor cars. The advantage of bringing gangs to their work fresh instead of more or less tired from the exertion of pumping a hand car is a substantial one in a windy prairie country, but one that is very difficult to express in terms of money with any precision. The actual saving in money an account of the reduction in the number of section foremen shown above totals about $136,000 per annum, and the economy resulting from the use of the cars is assumed as being not less than $150,000 per annum. The economy is not the result of additional cars supplied during the past two years but is the result of a revision of section lengths in the light of the very pressing necessities of the last year. The floating track gangs are not equipped with motor cars because of the short season.

For several years the Chicago, Burlington & Quincy has been following a definite program that will finally result in equipping all section, extra and bridge gangs with motor cars. To date there are 1,266 such cars in service on this road, resulting in an estimated average saving of 30 min. per man per day in the time going to and returning from work. Based on an estimate of six men to the gang, working 250 days per year, this indicates a saving of $379,800, without considering the other benefits from transporting materials, moving men between jobs, etc.

The maintenance forces of the Missouri, Kansas & Texas have been completely equipped with motor cars, the following number of cars being in use:

Track gangs	414
Bridge and Building gangs	37
Inspection cars used by roadmasters, supervisors, signalmen, etc.	238
	689

The saving estimated to have been accomplished by the use of these motor cars is $21,796 per month in the time of section and extra gangs alone. Nothing has been included in this estimate for the greater efficiency resulting from the use of these cars by inspectors and supervisory officers.

The estimated savings effected by the use of motor cars in track maintenance on the Chicago Great Western are given in the following table:

Cost of 180 motor cars at $325 each	$ 58,500
Less cost of 180 hand cars at $55 each	9,900
Excess investment on account of the use of motor cars	$ 48,600
Expenses	
Six per cent on investment	$ 2,916
Depreciation—12½ per cent	6,075
Cost of operating and maintaining	32,400
	$ 41,391
Savings	
Seventy section foremen's salaries	$ 7,700
Time saved in going to and from work and in patrolling sections one-half hour per man per day	11,932
Per month	$ 19,632
Per annum	$235,584
Less interest on investment, depreciation, operating and maintenance cost	$ 41,391
Saving per annum	$194,193

(Present cost per motor car installation, $275.)

During the six months ending October 31, 1921, section motor cars were made available for every section

and carpenter crew on the Great Northern. As a result the section limits on practically all portions of the line were extended, at a saving of $300,000 in six months.

The closest estimate that can be made on the Chicago, Rock Island & Pacific shows a return of approximately $155,961 per annum from the use of motor cars.

The officers of the Union Pacific believe that while economies have been produced by the use of section motor cars, by providing more rapid travel between headquarters and the site of the work, the amounts thereby saved are not always ascertainable. It is believed, however, that under the existing wage rates, and working conditions, such provision is of the greatest importance and it is proposed to equip all principal sections and gangs with cars.

All section and floating gangs on the El Paso & Southwestern are now provided with motor cars and have been for several years. This road figures the saving by the use of these cars compared with the old hand cars to be one hour per day for each section man, or, on the basis of present forces, the equivalent of about $200 per day.

Another western railroad has in service approximately 700 motor cars, which equips about 60 per cent of its regular track forces. It is estimated that during the 18 months ending October 31, 1921, the saving of man hours amounted to about $400 per car per year.

Burlington Creosotes Cypress Piles

By G. A. HAGGANDER
Bridge Engineer, Chicago, Burlington & Quincy

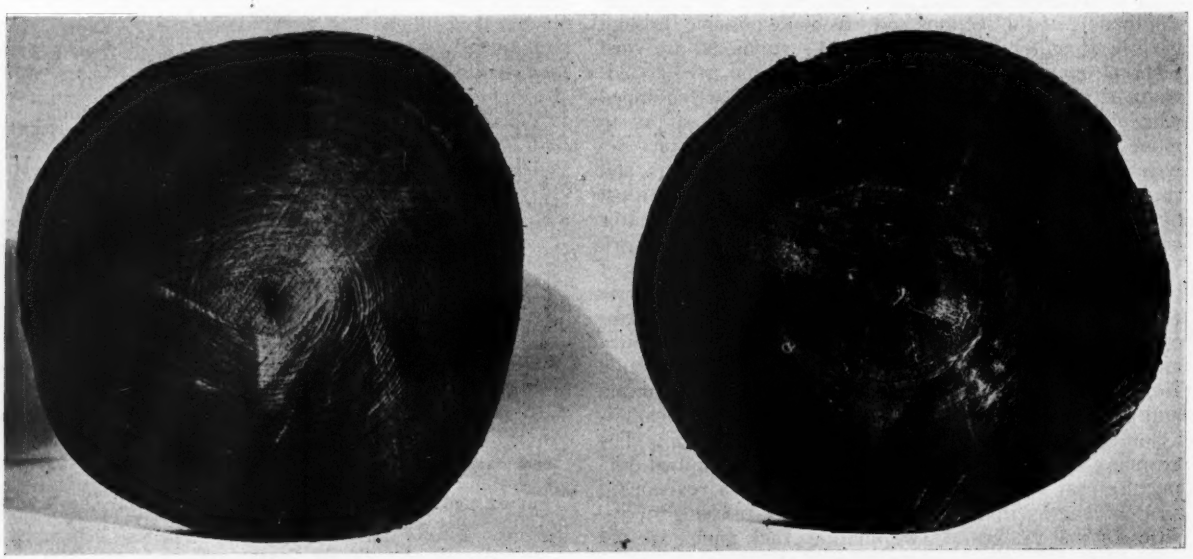
FOR A NUMBER of years the Chicago, Burlington & Quincy has been using red oak piles treated with creosote for the larger part of its pile trestle bridges. The results obtained have been satisfactory, but the care required to get the piling properly cut, loaded and seasoned has been very great. At times the market has been such that this kind of timber has been hard to get.

In looking around for a possible substitute it was found that there was a large amount of cypress available close to its lines. This is known as white cypress and is found in southeastern Missouri and northeastern Arkansas. It has considerable sapwood and if used untreated would have a short life. Heart cypress resists decay well and it was thought that if the sapwood was thoroughly treated good results as to life would be obtained. After purchasing a small amount of this early in 1921 serious doubts were entertained as to whether it could be treated properly. Experiences of others were that it was highly resistant to the absorption of creosote and as far as known it had not been treated successfully.

J. H. Waterman, superintendent of timber preservation of this road, felt confident that this particular kind of cypress would take treatment and after the piling had been seasoned somewhat experiments were made. The piling was still a little green and the creosote oil not first class, but the treatment of the first charge was successful. The piling was steamed three hours and subjected to a vacuum for four hours, after which creosote to the extent of 28 per cent by volume was injected. A good penetration was secured.

After the piling was seasoned thoroughly and some first-class creosote oil received other tests were made. Charges of piling 30 ft. long and 60 ft. long were treated to refusal, after which some piling was cut to obtain cross sections, and others were tested by means of an increment borer. The piling was first steamed for two hours at 20 lb. pressure. A vacuum was drawn for four hours with a maximum of 24 in. The solution pressure was then applied for 11 hrs. 20 min., working up to the maximum pressure of 175 lb. in one hour. This pressure was held until the end of the pressure period, at which time the pump did not take anything out of the measuring tank for one hour. A final vacuum was drawn for 30 min. The net absorption was 23.01 lb. of oil per cubic foot.

In treating piling of this kind for regular work it is proposed to leave in about 13 lb. of creosote oil per cu.



Specimen Sections of Creosoted Cypress Piles

ft. The piling will be steamed for two hours at a pressure of from 15 to 20 lb. per sq. in. A vacuum will then be drawn and held for at least 15 min. after the maximum has been reached. Before the creosote solution, heated to 180 deg. or 200 deg. F., is introduced, the vacuum will be broken to such an extent that the kick back will be large enough to leave about 13 lb. of creosote per cu. ft. in the pile. Forty-five minutes will be taken to bring the pressure up to the maximum of 150 lb. per sq. in., and it will be held until the refusal point is reached. A final vacuum will be drawn until the piling can be withdrawn from the retort without drip.

About 150 piling, 50 ft. in length, have been driven recently in a river bridge through coarse sand and gravel. The penetration obtained has been 40 ft., but the driving is so difficult that even with the aid of jet pipes an average time of nearly 1½ hours is required on each pile. The piling has stood up under this severe service in an excellent manner, driving fully as well as red oak and far superior to cedar. Most of these piles were cut 4 ft. from the butt end, and two typical cross sections are shown in the illustration.

From the data obtained, the treatment can be done satisfactorily; the piling will stand extremely hard driving and the life of the piling will be as great as that of any other kind obtainable on the territory through which the road passes; this, because of a lower cost for the timber, results in a substantial economy.

Maintenance Department Can Save Fuel

By W. S. BURNETT,

Engineer Maintenance of Way, Cleveland, Cincinnati, Chicago & St. Louis, Springfield, Ohio

ON THE Cleveland, Cincinnati, Chicago & St. Louis the maintenace of way department handles the coaling stations. There is little chance to save coal in the operation of these stations unless it is to watch the loading of engine tanks to see that they are not overloaded, that coal spilled at the dock is kept picked up and that all coal is cleaned out of the cars. If the dock is operated by steam, careful firing of the boiler is required to avoid extravagant fuel consumption. The fuel compartment of the dock should be cleaned regularly to avoid the accumulation of fine coal and consequent waste if this fine coal is loaded on engine tanks; also to avoid loss by spontaneous combustion if the coal should take fire in the dock.

The men in charge of coaling stations should keep an accurate record of all cars of coal unloaded and make daily reports to headquarters so that the actual fuel consumption can be known and the cost determined.

They should keep a sufficient supply of coal in the dock so that the breakage will be reduced to a minimum. If the coal is permitted to fall from a considerable height it will break up and locomotives will be furnished too large a proportion of fine coal. This has been the cause of numerous complaints from enginemen. By keeping the docks nearly full there is less likelihood of the lumps rolling away from the fine coal and causing a decrease in value of the fuel when used on engines.

The cost of operating coal docks should be checked continuously in order that the cost of handling may be kept to a minimum, consistent with good service, as this is reflected in the fuel price.

While the maintenance of way department is not so vitally interested in fuel conservation as the transportation and mechanical departments, nevertheless, by close co-operation with these departments, considerable saving can be effected. Nearly all railroad employees are in some way responsible for a part of the coal consumed. Neither the locomotive engineer nor the fireman can be held responsible for all of the coal consumed on the engines while they are on duty, because of the indirect responsibility of officers and other employees. The maintenance of way department shares this responsibility.

The maintenance of tracks and bridges in many instances requires slow orders for the safety of trains. These slow orders mean greater fuel consumption, especially if the speed is restricted below 30 miles per hour. The laying of new rails and the reballasting of the tracks require reduced speed. The program of work should be considered carefully, so as to prevent the stopping or slowing up of trains. In laying rail on double track lines this can be partly avoided by using single track during the hours the work is in progress. On single track lines the best time between trains should be selected so that a considerable stretch of track can be laid in a short time and full spiking and bolting carried on under traffic. While reballasting tracks care should be taken not to strip too far ahead of the gravel supply so as to avoid skeleton track. The track should be in shape for the passage of all scheduled trains during the working period, and, if filled with ballast, should be left in condition for full speed during the night.

During the reconstruction of bridges, temporary work, if required, should be such that a fair degree of speed can be maintained. In all cases of bridge work the material for the job should be on hand or in sight so that the work can proceed rapidly and not be held up on account of shortage of material. Where slow orders are placed on bridges for the protection of workmen and are not required for the safety of the structure, these orders should be maintained only during working hours.

The location and maintenance of signals and switches are very important factors in fuel conservation. These should be so located that they can be seen readily from a distance. If possible they should also be located at a point where tonnage trains can be started easily. Care should be exercised to keep signal and switch lights in good burning order. The lenses should be kept clean and good oil and wicks furnished. Signal lights out or burning dim mean stops and delays to trains, with consequent consumption of fuel. All cases of bad lights should be reported immediately by train crews.

Due to increased tonnage of trains the question of extending passing tracks is arising continually. The maintenance of way department can assist greatly in securing authority for extensions by making careful and close estimates so that the expense will be reduced to a minimum. When deciding on the question of the extension of passing tracks, consideration should be given to the saving of fuel as the doubling over of a few trains greatly increases operating expenses.

The location of industrial and yard tracks should also be considered carefully. Industrial tracks should be planned to consume the smallest amount of time in switching, and this can be done by seeing that the grades

are easy and the curvature low. In placing yard tracks the grade should be laid so that the cars will require a minimum amount of power from engines. The location of the ground selected for yards is sometimes favorable to this, but if not, with a small additional expense for grading, the cars can be made to run by gravity, at least for movement in one direction. The fuel saving here will be enormous and more than compensate for the extra cost of grading.

The operating conditions to be met by the installation of interlocking plants should be given careful attention to insure that the proper signals are installed. The failure to consider the arrangement of signals properly, results in delays to or stopping of trains, more especially when interlocking plants are located closely and do not work in unison. It is, of course, apparent that the maintenance of interlocking plants should be followed up closely, renewals anticipated and every effort made to keep them in continuous service. A plant should not be taken out of service for overhauling until a sufficient supply of repair material is on hand and it should be returned to service with the least possible delay.

Water conditions on a railroad have a very marked effect on fuel consumption. This should be taken into consideration in the selection of the source and the quality of the supply. In determining the source of the supply every effort should be made to ascertain that the water will be satisfactory for engine use with the least amount of treatment. Water stations should be located at points where the grade of the track is light so that heavy fuel consumption in starting trains will not be required.

The operation of work trains under the jurisdiction of the maintenance of way department is another factor which materially affects fuel consumption. Representatives of the maintenance of way department in charge of work trains should keep in close touch with the dispatcher so that they can conduct their work efficiently with the least possible delay to their own or to other trains. This is especially important when work is being done on tracks where the grade is heavy or in yards where several switch engines are working. The stopping of passenger or local freight trains to unload maintenance of way employees or maintenance of way materials should be watched carefully and all unnecessary stops of the trains avoided.

In addition to handling coal at coaling stations, the maintenance of way department also distributes coal for other facilities, such as water stations, power plants, etc. They also unload the coal for use at passenger and freight stations and for offices. Most of the coal consumed at these points comes from that picked up on the line, principally in yards where there is a large movement of coal. A large number of hopper cars are dumped in yards, either through rough handling or defective equipment. It is the duty of the maintenance of way men to pick up this coal. It should be reclaimed promptly and loaded free from dirt and cinders. In the event of an excess of this coal, it may be used for locomotives. Lumps of coal falling from engine tanks or cars should be picked up currently and free from dirt.

Heating plants and stoves in railway buildings should be inspected and necessary repairs made before cold weather. Coal bins should be kept in good condition and kept locked if conditions warrant.

At maintenance of way steam plants, boilers should be assigned to the best advantage for the work to be performed. These boilers should have regular inspection and be kept free from leaks and other fuel-wasting items. The grates, dampers, flues, etc., should be given special attention so that economical service can be maintained.

Wood Preservation Statistics for 1921

WITH THE treatment of 55,383,515 crossties in 1921 the use of treated ties by the railroads of the United States now covers practically one-half of all of the ties used. This fact is indicated by the statistics of the American Wood Preservers' Association prepared in cooperation with the Forestry Department of the United States Department of Agriculture. The quantity of tie timber preserved in 1921 was 166,150,545 cu. ft., as compared with 134,962,596 cu. ft. in 1920. The total volume of wood treated for all purposes in 1921 was 201,643,228 cu. ft. as compared with 173,309,505 cu. ft. in 1920. Thus the increase in the quantity of all timber treated is less than the increase in timber treated in the form of ties only. This indicates there was an actual decrease in the preservation of timber for other purposes than ties. The principal decrease occurred in piles, only 5,581,999 cu. ft. being treated in 1921 as compared with 8,092,546 cu. ft. in 1920. There was also a decrease in the preservation of crossarms, wood blocks and miscellaneous timber, and nominal increases in the preservation of poles and construction timber. This comparison is made more apparent in one of the tables.

Studies of the figures for the use of preservatives during the last two years indicates a greater increase in the use of creosote than in the case of zinc-chloride. In 1921, 76,513,279 gal. of creosote were used in comparison with 68,757,508 gal. in 1920. In the case of zinc-

Cubic Feet of Timbers of Various Classes Treated in 1920 and 1921

Classes	1920	1921
Crossties	134,962,596	166,150,545
Piles	8,092,546	5,581,999
Poles	10,309,746	10,959,256
Wood blocks	6,741,410	6,202,904
Cross arms	318,707	108,715
Construction timber	11,645,811	11,876,708
Miscellaneous lumber	1,238,689	753,101
Total material treated	173,309,505	201,643,228

chloride the amount used in 1921 was 51,375,316 lb., as compared with 49,717,929 lb. in 1920. The increase in the consumption of creosote is a result of the reopening of the foreign supply at lower prices. There was actually a small decrease in the consumption of domestic creosote. A considerably larger quantity of creosote was imported than in any year since 1916, although the total quantity of imported oil in 1921 is still less than half of the amount imported in 1913.

This relationship in the consumption of the two principal preservatives is noted in their relative use in the

Wood Preservation 1909-1921, Together With Consumption of Creosote and Zinc Chloride

Year	Total Material Treated Cubic Feet	Number of Cross Ties Treated	Creosote Used Gallons	Zinc Chloride Used Pounds
1909	75,946,419	20,693,012	51,426,212	16,215,107
1910	100,074,144	26,155,677	63,266,271	16,802,532
1911	111,524,563	28,394,140	73,027,335	16,359,797
1912	125,931,056	32,394,336	83,666,490	20,751,711
1913	153,613,888	40,260,416	108,378,359	26,466,803
1914	159,582,639	43,846,987	79,334,606	27,212,259
1915	140,858,963	37,085,585	80,859,442	33,269,604
1916	150,522,982	37,469,368	90,404,749	26,746,577
1917	137,338,586	33,459,470	75,541,737	26,444,689
1918	122,612,890	30,609,209	52,776,386	31,101,111
1919	146,060,994	37,567,927	65,556,247	43,483,134
1920	173,309,505	44,987,532	68,757,508	49,717,929
1921	201,643,228	55,383,515	76,513,279	51,375,360

preservation of crossties. During 1921 66,139,398 cu. ft. of crossties were subjected to preservation with creosote as compared with 49,114,551 cu. ft. in 1920. This in-

crease is considerably larger than in the case of the zinc-chloride ties, where the volume in 1921 was 90,797,841 cu. ft. as compared with 87,398,106 cu. ft. in 1920.

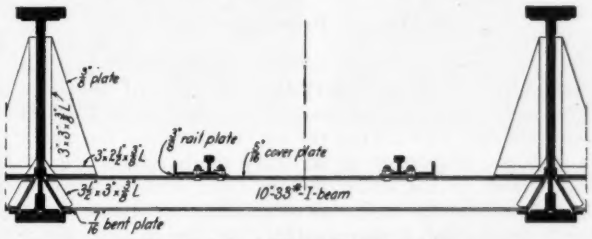
Of the total number of crossties treated during 1921, 35,819,931 were hewed and 19,563,584 were sawed. The crossties treated in the largest quantity were those of yellow pine, the total number reported being 21,511,719. Oak ties ranked second with 12,838,157 and Douglas fir ties were third with 4,960,115. Other ties treated in any quantity were those of western pine, beech, gum, tamarack, maple, birch, elm and hemlock.

A total of 22,046,466 crossties were treated with creosote in 1921 and 30,265,947 with zinc chloride. The number of ties impregnated with the zinc-creosote emulsion was 3,061,234, while 9,868 were subjected to treatment with miscellaneous preservatives.

In treating ties with creosote an average absorption of 7.21 lb. per cu. ft. was obtained. Where zinc chloride was used the average quantity of preservative that was forced into the wood was 0.48 lb. per cu. ft. With the use of zinc-creosote emulsion the injection amounted to 0.49 lb. of zinc and 2.75 lb. of creosote. Practically all of the wood-preserving processes used commercially were employed in the treatment of crossties.

Chicago Track Elevation Structures Being Strengthened

ABOUT TWO YEARS ago, the Illinois Central completed the replacement of its street subway structures for the first track elevation work done in Chicago in 1892. Evidence that some of the other structures of the early track elevation work in that city are gradually nearing their service life is seen in the replacement of the floor system of subways used by the Chicago, Rock Island & Pacific and the New York Central in their joint entrance to the La Salle Street station. The first stage of this work was completed last fall and



The Original Floor Construction

it is anticipated that further progress will be made during the coming year. The present work is of interest because it relates to a type of floor which was rather popular in the early subways, namely transverse steel I-beams covered with a steel plate, the rails being supported on a rail plate which was carried directly on the cover plate and secured by means of clips. The old floor in this case is being renewed with heavier construction of substantially the same type though with a number of improvements that decrease the cost of the work.

Old Floors No Longer Adequate

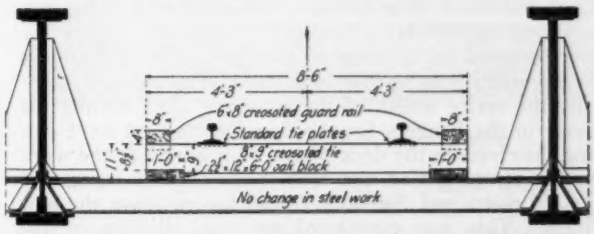
The old Rock Island-New York Central subways had floors consisting of 10-in. 33-lb. I-beams spaced 12-15/16 in. center to center and covered with a place 15/16 in. thick, the general nature of the construction being shown in Fig. 1. However, after 20 years, through increases in the imposed loading and reduced strength of the steel on account of corrosion, it became necessary to relieve the floor beams by introducing cross ties supported on the beams by means of oak blocks under their ends. This had the effect of concentrating the live load on the beams closer to the ends and thereby reducing the live load bending moment. This, however, was designed purely as a temporary expedient and conditions finally required the renewal of the floor with heavier material.

The new floor beams are 12-in. 70-lb. Bethlehem girder beams carried on end connections substantially like those in the old structure and covered with a ⅜-in. plate. The track is supported on this floor after the manner of the original construction as modified, that is, with the use of cross ties and bearing blocks, every third tie being made long enough to engage a bracket on the girder so that the track can be secured to line without any connection being made through the deck plate.

The construction differs from the old in one important essential. There are no direct rivet connections between the deck plate and the flanges of the I-beams. The only rivets in these plates are those required for splices, for connections between plates, for curb ankles along each side and for clip plates for holding the plates in position on the beams. This change in construction was effective in eliminating practically 1,000 rivets per track for each bridge, or approximately 26,000 rivets for the work done on 13 subways last year.

Reduce Field Riveting

In order to further eliminate field riveting, the old shelf angle which was riveted to the web of the girders and to the old deck plates, was not provided for under the new arrangement. The new deck plates are entirely free or separate from the girder webs, small angles being riveted along the edges near the girders and the space



Introduction of Ties Reduces Stress

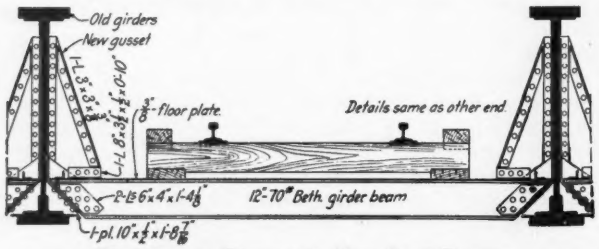
between the web and this angle being filled with concrete for a water-shed.

The line on which this work was done consists for the most part of four tracks, the right of way being on the center line between tracks so that each railroad owns two tracks. The two middle tracks are used as joint double tracks, the outside tracks being used as service or standing tracks. The work has been carried on jointly by the two roads; but instead of working independently with arrangements for cross biling, it was decided to carry on the work simultaneously with a crew for each road working on either side of the center line and arranging for an amicable sub-division of the work to be done on the cen-

ter line girder as occasion demanded. This work was carried on under this arrangement without any misunderstanding or friction and the presence of the two crews assigned to exactly the same character of work served to foster a friendly rivalry which was instrumental in speeding up the progress. During the course of the work on a given structure a portion of the two middle tracks was isolated by introducing temporary cross overs to the outside track on either side. This left the tracks over the bridge free for use of the construction forces and for occupancy by the erecting equipment. According to the usual arrangement the compressor car occupied the track at one end of the bridge and the derrick car that at the other end. The manner of carrying out the work at the individual bridge was as follows:

First the ties and rails were removed from the bridge. At this time the concrete along the sides of the girders and the ends was also removed and the brackets were burned with acetylene torches on the girders between the main line and side tracks, this being necessary so that the old rivets could be cut and new ones driven.

On many of these bridges considerable dirt had collected and packed down and hardened, and all this had to be removed before access could be had to the deck



The Present Floor with New Steel Beams

plates so as to cut the rivets. This work usually required about half a day's time.

Use Power Rivet Cutter.

The next step was cutting the rivets. When this work was started at Twenty-fourth street, the rivets had to be cut by hand, which was a slow process, requiring 13 days. However, it did not take long to see that a great economy could be effected by investing in a Duntley-King pneumatic rivet buster, with which it was possible to knock out 20 rivets to one by hand, and reduce the time required for a bridge to five days. The first step in rivet cutting was on the brackets and angle irons running the entire length of the structure, then cutting the rivets in the hangers for the floor beams, and next cutting the rivets in the deck plates. To subdivide the work on the center girder, the New York Central forces cut the old rivets and the Rock Island forces drove the new rivets. This was considered an equal division of the work, with the exception of the Thirty-ninth street subway, where this method of procedure was reversed with respect to the center girder.

The deck plates were loosened and pried off and swung around in a parallel position, making them convenient for handling with the derrick. The derrick was then used to lift these plates and carry them from the bridge out of the way. This being finished, the beams were next removed, using the derrick also for this purpose. Two beams could be removed at once and carried back out of place, and then a new beam brought up and installed.

This method was followed until all of the beams were removed and the new ones installed. In doing this the rivets on the girder between the main line and the side track were driven out of place as the old one was removed, and as the new beam was installed it was held in place by a drift pin or a bolt, in some cases, until necessary to go on with the riveting.

When the old beams were removed the bottom flange of the girder was thoroughly cleaned of all rust and dirt and repainted on the face where the beam had been removed before the new beam was put in place. The new beams all being in place, the new top deck plates were installed and the riveting was then started on the floor beams. Riveting the deck plates was the next step and riveting the brackets last. During the period of riveting part of the crew was loading up the old beams and plates in gondola cars for shipment.

Whenever a girder was found out of level it was jacked up and shimmed to a fairly good level by placing oak board shims underneath the bearings. This was done in all cases where practicable.

The rivets in the floor beams were all tested by inspectors from both the Rock Island and the New York Central, those for the center girder were inspected by both inspectors.

After the steel erecting crew had completed its work by replacing the new beams and deck plates, painters did the necessary painting, then the carpenter forces replaced the ties and the section forces replaced the rails. The division forces put on the necessary concrete work along the girders, and, where necessary, removed the old cracked and shattered bridge seats under the west girders and replaced them with new concrete bridge seats.

No Water Proofing Done.

As the floors of these bridges are level, it was not thought necessary to waterproof the tops of the deck plates, as it would not be possible to obtain a good job of waterproofing with the ties resting directly upon the plates, as they do. However, as so many rivets connecting the deck plates to the beam flanges have been eliminated, thus doing away with the possibility of many loose rivets developing, it was thought that due to this change the steel itself would be tight enough to hold the water until it had either evaporated or run off over the backwalls of abutments.

As mentioned previously, the knocking out of the rivets on the Twenty-fourth Street bridge was done by hand, and it took 13 days to complete the work on that one bridge. However, after thorough experience with the pneumatic rivet ruster, this time was cut down to about five days to a bridge.

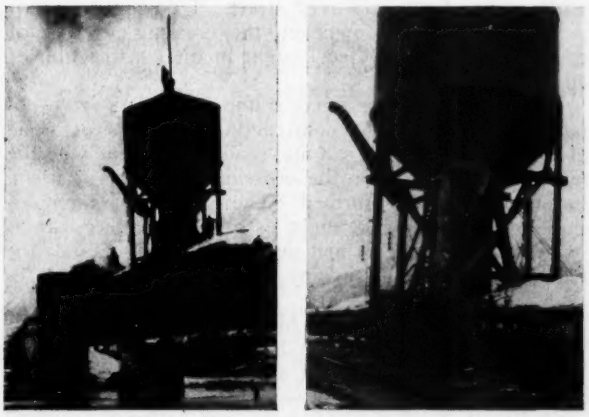
This work was done under the direction of I. L. Simmons and B. R. Leffler, bridge engineers respectively of the Chicago, Rock Island & Pacific and the New York Central, Western Lines. We are indebted for the above information to S. T. Corey, assistant bridge engineer of the Chicago, Rock Island & Pacific, Chicago, Illinois.

CULTIVATING FRIENDS—"If the foreman gets into difficulty with the farmer, and the farmer gets it into his head that he can hurt the foreman, he won't do a single thing to favor the railroad company. When I was working on a section I always made it a point to cultivate the friendship of the farmer. If there was a bad piece of fence the farmer wanted repaired, I always stopped and repaired it for him, or if I could help him in any way I was glad to do it. I want this man to speak well of me and say, 'Well, he was a pretty good Dutchman after all."—*From a comment made by A. Mendershausen, section laborer on the M. K. & T., at a meeting of maintenance of way employees of that road.*

Moving a Steel Tank Two Miles by Railroad

MOVING a 40,000 gal. conical-bottom steel water tank two miles over a railroad without dismantling it is a feat completed successfully some time ago on the Canadian National. It was necessary to transfer this tank from Resplendent, B. C., to Red Pass Junction, and to avoid taking the tank down and reerecting it, the plan was hit upon of supporting the tank on flat cars, hauling it over the line and then setting it down on a new foundation prepared for it at the new site. The problems imposed by this undertaking were the supporting of the tank on the cars, securing it against overturning, transporting it around two six-degree curves and placing it on the new foundation.

To place the tank on cars, it was necessary to build a track up to the tank on each side, to run out a car on



Two Views of the Tank on Its Way to the New Site

each end of these tracks, to jack the tank up high enough so that the riser pipe would clear its foundation and permit the completion of the track across the gap which had been left because of the interference of the riser pipe. The tank was supported on two frame bents, erected on the flat cars just inside the steel corner posts upon which the tank was normally supported. The two bents were tied together at the top with two 8-in. by 8-in. timbers, notched over the caps and bolted one on each side of the tank bottom. The weight was distributed on the bents by placing four short posts on top of the bents just back of the columns, the top ends of these posts wedging against the bottom of the tank. The bents were well sway braced in both directions, and were bolstered on the cars.

To get the center of gravity of the load as low as possible, the flat cars were loaded with ballast and in addition a floor of three-inch planks was laid in the bottom of the riser pipe and about 3½ cu. yd. of gravel was deposited in the bottom of the riser. As a further precaution, to make the load on the flat cars and the weight of the tank act as a unit, guy ropes were run from the sides of the cars to the tops of the tank columns on the opposite sides

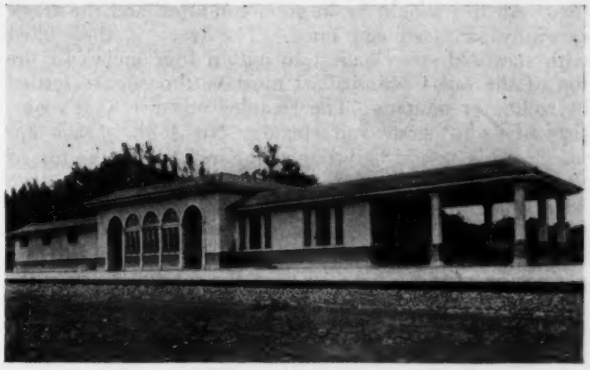
Another problem was introduced by the fact that the riser pipe, occupying a position between the two flat cars, did not permit of the coupling of the cars. As a substitute for this the cars were held together by chains. The passage of several six-degree curves also introduced some complications. The bolsters on which the timber bents were supported on the cars were equipped with two-inch pins through the center in order that the cars might be free to swing and leave the bents in a fixed position relative to the tank. It also necessitated the placing of turnbuckles in the chains by which the cars were coupled and also in the guy lines from the sides of the cars to the top of the tank columns. These turnbuckles were adjusted on approaching and leaving the curves and no difficulty was experienced in rounding them. Upon reaching the destination the cars were run out onto a spur track over the new location and the tank jacked down into place. The actual time that the main line was occupied with this unusual train was 2 hr. 20 min. and no delay resulted to regular transportation movements. The tank showed no damage for having made the trip.

The above information was taken from an article by C. F. O'Connor, bridge and building supervisor, Canadian National Railways, appearing in "Water Tower." The tank was of a type built by the Chicago Bridge & Iron Works and the Horton Steel Works, Ltd., of Canada.

An Attractive Passenger Station

THE SOUTHERN Pacific has recently completed the construction of a combination freight and passenger station at Atascadero, Cal., which affords a striking illustration of what can be done with a small railway station in the way of architectural treatment. Located 220 miles south of San Francisco, in a country enjoying much natural beauty, the building adapts itself in a particularly pleasing manner to its environment, as well as embodying a number of original features in design.

As shown in the accompanying illustration, the build-



A Front View of the Atascadero Station

ing is a one story structure with a freight house and baggage room at one end, the ticket office in the center and a waiting room at the other, and is equipped with commodious platforms. The exterior walls are of cement stucco with a brick veneer base and the roof is of tile. The freight house portion is 21 ft. wide and 60 ft. long, having a 30-ft. by 36-ft. platform on the end and an 8-ft. by 50-ft. platform in the rear. Immediately adjacent to the freight room is the baggage room which is 21 ft. wide and 18 ft. 6-in. long. The office is 14 ft. by 29 ft., with a trainmen's lobby and counter and a convenient place for the storage of records. The general waiting room is 21 ft. by 25 ft., and is supplemented by a women's rest room 18 ft. by 13 ft., access to which from the general waiting room is had through double French doors. At the waiting room end of the station, as shown on the photograph, is an open area 22 ft. by 24 ft., which is

provided with well sheltered seats and affords an unobstructed view of the surrounding country. The building is heated with a hot water system, the central heater being located in the office.

The floors of the interior waiting room, office and baggage room are of concrete, while the floors of the freight room and exterior freight platforms are constructed of 1¾ in. T. & G. cedar. All interior walls and ceilings of the building are plastered with the exception of those in the baggage and freight room. The track serving the freight house is constructed on the rear side of the building so that it may be used without interfering with passengers. The platform between the station and the track consists of crushed rock and oiled rock screenings with a concrete curb along the track.

This structure was built under the direction of W. H. Kirkbride, engineer maintenance of the Southern Pacific, to whom we are indebted for the above information.

The Construction of Road Crossings*

BY S. A. HART
Supervisor, Pennsylvania System, Mt. Holly, N. J.

A NUMBER of years ago it became evident that the old style plank crossing must be replaced with one of other materials on account of the scarcity and high price of suitable timber. There was a further desire to obtain a material from which crossings of a more permanent nature could be constructed. This led to experiments with various kinds of tar and oil products until now we have three or four of these from which to choose. Two of the more commonly known are "Tarvia KP" and "Headley No. 1." I have had no experience with Tarvia but the general method of applying is to mix the oil with the stone and allow the mixture to cure for 5 days before putting it in the crossing. It is claimed that this makes a good crossing.

We have installed a number of crossings with the Headley No. 1 mixture. The preparation for this includes the removal of all old ballast and dirt to the bottom of the ties or preferably about two inches below the ties. All ties should be in good condition and the track carefully surfaced and lined. The track is then filled with standard stone ballast to within four inches of the top of the rail. This ballast must be thoroughly settled by rolling or tamping. The Headley mixture which consists of ¾ in. stone and Headley No. 1 oil is then applied. This should be brought one inch above the top of the rail to allow for settling. The mixing may be done on a small wooden or sheet iron platform. Care should be taken to see that the stone is entirely covered with oil. The sides of the rail should be coated with oil before applying the mixture. As soon as the mixture is in place and has been tamped, traffic may be permitted to run over it. If it develops in the course of a few weeks that the settlement is more than is desired a little patching will bring the surface to the proper height. No provision needs to be made for flange-ways as the wheels of engines and cars make their own flange-way.

For a crossing nine ft. wide, the following quantities of material are needed per running foot:

3 gal. of Headley No. 1 oil.
7 cu. ft. of standard ballast.
2 cu. ft. of ¾-in. stone, and a small quantity of grit for top finish.

The cost of these materials will differ somewhat in different localities. The cost of the labor for digging out and applying the materials will also vary but should be about $1.50 per lineal foot.

We have had some of these crossings in service for over a year and they are in very good condition. Recently we installed a set of 130 lb. rail crossing frogs at a point where the steam railroad crosses a double track trolley line. After allowing for proper settlement the frogs were resurfaced and a Headley crossing installed. The crossing now compares favorably in smoothness with other parts of the improved street. I do not believe it is possible for water to get into this crossing and that, of course, is the main object sought in the construction of any crossing.

At points where the street traffic is light we have obtained good results by constructing crossings of stone grit mixed with coarse salt and road oil. By applying the oil several times after the crossing has been in use a hardened surface is formed. The expense of maintaining such a crossing is slight as all that is necessary is to keep a small pile of grit near the crossing so that the track walker can fill in any small holes from time to time.

In the course of county highway improvements during the past few years, we have had several crossings built of the regulation sheet asphalt at points where improved roads cross the railroad. At one location, we installed treated oak ties, filled the crossing with standard ballast and then had the final four-inch top made of sheet asphalt which was rolled with a 12-ton roller at the same time the balance of the road was rolled. A strip of wood was first placed along each side of the rails and after the main body of asphalt had taken a set, the wood was removed and hot asphalt poured along the rail to fill the space. In my opinion this crossing is absolutely waterproof. The flangeway was made by the wheels of the train. The hot asphalt was poured along the rail to produce a substance that would be more resilient than the cold asphalt, and also fill all crevices so as to make the crossing waterproof.

In discussing the paper Ralph Haring, Supervisor on the Long Island at Jamaica, N. Y., gave a brief outline of his experience with solid concrete and concrete slab road crossings. He put in a solid concrete crossing on one of the heaviest traveled roads in Long Island, the crossing being built in two sections to prevent closing the highway. New creosoted ties and tie plates were applied, the rail was relined and the ballast brought to within 2 in. of the top of the ties. The crossing was built within three inches of top of the rail and the top dressing added. The concrete extended about two feet outside of the rail, joining the concrete highway. The cost approximated $5.60 per square yard of surface, including labor and material.

C. A. Joyce, supervisor on the Erie at Paterson, N. J., described a test made to determine the relative life of plank and wooden blocks made of old bridge ties. Half of the crossing was built of plank construction and the other half was paved with these blocks. The life of the blocks was about three times that of the plank, the former giving a life of 6 or 7 years and the latter two years.

*Abstracted from a paper presented before the Metropolitan Track Supervisors' Club, New York, on August 12, 1922.

The Labor Board Is Now Hearing New Maintenance Cases

Arguments on Wage Advance and Certain Rules Are Being Presented by the Employees and the Management at Chicago

THE QUESTION of wage rates for employees of the maintenance of way department is now again being argued before the Railroad Labor Board in a hearing that commenced on August 28. This is the result of demands made on the railroads by the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers for a rescinding of the wage reductions authorized by the Labor Board as effective July 1. More correctly, the brotherhood has asked that the rates in effect since July 1 be raised so as to equal the highest rates ever in effect. Conferences have been held between the individual railroads and the representatives of the employees with respect to these demands and in the absence of any agreements representations have been made to the Board by nearly all of the roads. Railroads concerning which such cases have been submitted to the Board are listed in the appended statement, which is correct to August 24, 1922. This list cannot be said to be complete because of the fact that other roads were expected to be represented in this hearing whose interest would not have been recorded until just previous to the opening of the hearing. As noted in this list, reference is made in many of the cases to both wages and rules. This means that in addition to a matter of wage increase, the employees on some of the roads have entered complaints regarding working conditions which are now presented for a re-hearing. The list also shows whether the submissions to the Board are joint as between the roads and the employees or whether "Exparte" submissions were by the employees alone.

While the list calls for a large number of individual cases the hearing is being conducted as a whole in accordance with the usual procedure of the Board on the basis of arguments from both sides with respect to all questions of wages or working conditions submitted. Any decision made by the Board with respect to the matters presented will be applicable alike to all the roads represented but not to roads or their employees who are not a party to this case.

Statement of Cases Included in Hearing August 28, 1922.

	Joint or Exparte	Wages	Rules
Atchison, Topeka & Santa Fe	Joint	x	x
Ann Arbor	Joint		x
Alabama & Vicksburg	Exparte	x	x
Vicksburg, Shreveport & Pacific.			
Baltimore & Ohio	Joint	x	x
Bangor & Aroostook	Exparte	x	x
Boston & Albany	Exparte	x	x
Boston & Maine	Joint	x	x
Buffalo, Rochester & Pittsburgh	Joint	x	x
Central Indiana	Exparte	x	x
Central Railroad of New Jersey	Joint	x	x
Chesapeake & Ohio	Joint	x	x
Chicago & Alton	Joint	x	x
Chicago & Eastern Illinois	Exparte	x	x
Chicago & North Western	Joint	x	x
Chicago, Burlington & Quincy	Joint	x	x
Chicago Great Western	Exparte	x	x
Chicago, Indianapolis & Louisville	Exparte	x	x
Chicago, Milwaukee & St. Paul	Exparte	x	x
Chicago, Rock Island & Pacific	Exparte	x	x
Chicago, Rock Island & Gulf.			
Chicago, St. Paul, Minneapolis & Omaha	Joint	x	x
Cincinnati, Indianapolis & Western	Exparte	x	
Cleveland, Cincinnati, Chicago & St. Louis	Exparte	x	x
Colorado & Southern	Joint	x	x
Delaware, Lackawanna & Western	Exparte	x	x
Denver & Rio Grande Western	Joint	x	x
Rio Grande Southern.			
Denver Union Terminal	Joint	x	x
Duluth, South Shore & Atlantic	Joint	x	x
Mineral Range.			
El Paso & Southwestern	Joint	x	x
Erie	Exparte	x	x
Ft. Worth & Denver City	Joint	x	x
Wichita Valley.			
Grand Trunk	Exparte	x	x
Great Northern	Joint	x	x
Gulf Coast Lines	Exparte	x	
Houston Belt & Terminal.			
Hocking Valley	Joint	x	x
Illinois Central	Joint	x	x
Yazoo & Mississippi Valley.			
Chicago, Memphis & Gulf.			
Kansas City, Mexico & Orient	Exparte	x	x
Kansas City Southern	Exparte	x	x
Texarkana & Ft. Smith.			
Arkansas Western.			
Poteau Valley.			
Port Arthur Canal & Dock Co.			
International & Great Northern	Exparte		x
Lorain, Ashland & Southern	Exparte	x	
Louisville & Nashville	Exparte	x	x
Louisville Henderson & St. Louis	Exparte	x	x
Maine Central	Joint	x	x
Portland Terminal.			
Michigan Central	Joint	x	x
Minneapolis & St. Louis	Joint	x	x
Railway Transfer Co. of Minn.			
Minneapolis, St. Paul & Sault Ste. Marie	Joint	x	x
Minnesota & International	Joint	x	x
Big Fork & International Falls.			
Missouri, Kansas & Texas	Joint	x	x
Missouri Pacific	Joint	x	x
Monongahela Railroad	Exparte	x	x
Nashville, Chattanooga & St. Louis	Joint	x	x
New York Central	Joint	x	x
Norfolk & Western	Joint	x	x
Northern Pacific	Joint	x	x
Pere Marquette	Joint	x	x
	Exparte		x
Philadelphia & Reading	Exparte	x	
Pittsburgh & West Virginia	Exparte	x	x
West Side Belt.			
Rutland Railroad	Joint	x	x
St. Louis-San Francisco	Joint	x	
San Antonio & Aransas Pass	Exparte	x	
San Antonio, Uvalde & Gulf	Exparte	x	x
Southern Pacific, Pacific System	Joint	x	x
Southern Railway	Joint	x	x
Northern Alabama.			
Atlantic & Yadkin.			
Tennessee Central	Joint	x	x
Terminal Railroad Ass'n of St. Louis	Joint	x	x
Texas & Pacific	Joint	x	x
Toledo & Ohio Central	Exparte	x	x
Kanawha & Michigan.			
Kanawha & West Virginia.			
Zanesville & Western.			
Toledo, Peoria & Western	Exparte	x	x
Trinity & Brazos Valley	Exparte	x	x
Union Railway of Memphis	Joint	x	x
Union Pacific	Joint	x	x
St. Joseph & Grand Island.			
Oregon Short Line.			
Ogden Union Railway & Depot Company.			
Oregon-Washington Railroad & Navigation Co.			
Los Angeles & Salt Lake.			
Wabash	Joint	x	x
Western Pacific	Joint	x	x

No Settlement of the Shop Strike

In spite of the succession of conferences which have been in progress almost daily since the very beginning of the shopmen's strike no agreement has been reached upon which a settlement could be based. Following proposals by President Harding which proved unsatisfactory to either one side or the other or both, plans were laid for mediation through the efforts of the officers of the five train service brotherhoods. Meetings were held in New York beginning Friday, August 18, between representatives of the Association of Railway Executives and the Big Five officers.

Those who represented the railway executives in the conference included T. DeWitt Cuyler, chairman of the Association of Railway Executives; W. W. Atterbury, vice-president of the Pennsylvania; Howard Elliott, chairman of the Northern Pacific; Hale Holden, president of the Chicago, Burlington & Quincy; Julius Kruttschnitt, chairman of the Southern Pacific; W. L. Mapother, president of the Louisville & Nashville; C. H. Markham, president of the Illinois Central, and A. H. Smith, president of the New York Central. The representatives of the train service organizations were Warren S. Stone, president of the Brotherhood of Locomotive Engineers; L. E. Sheppard, president of the Order of Railroad Conductors; W. N. Doak, vice-president of the Brotherhood of Railroad Trainmen; E. H. Robertson, president of the Brotherhood of Locomotive Firemen and Enginemen, and T. C. Cashen, president of the Switchmen's Union of America. The matter of settlemen in this conference hinged entirely upon the question of seniority and no agreement was reached.

Subsequent efforts at peace were undertaken on the part of executives representing about 75,000 miles of railroad with the view to securing agreements in so far as these properties were concerned but were not successful.

Not Entitled to Carpenter Foreman's Pay

A bridge carpenter on the Texas & Pacific was placed in charge of a gang of laborers framing wings and placing surface guards, for which he was paid the wage of an assistant foreman or five cents in excess of the wages of a bridge carpenter. After being employed at this work from February 1 to December 16, 1920, the question was raised as to his rights to the full pay of a carpenter foreman, it being the contention of the employees that he performed all the work expected of a foreman. The railroad pointed out that the men whom he was supervising were not carpenters, but laborers, and that the work that they were doing was not such as is ordinarily expected of bridge and building carpenters. It was also shown that the man had agreed to work at the specified rate of an assistant foreman.

The decision of the Labor Board is that the supervisory service performed by the man was not comparable with the service usually expected of bridge and building foremen, and sustained the carrier's position. (Decision No. 894.)

Claim for Overtime for Pumper Denied

In a case brought before the Railroad Labor Board by the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers, claim was made against the Lehigh Valley for overtime for a pumper in charge of a water station on that road. The employees stated that as it was necessary for this man to have water in the tank at all times, day and night, he was required to work overtime and it was the usual thing for him to have to pump water every night as well as every day. It was contended that he should be paid the regular rate for that position with overtime. The carrier maintained that this position had been operated by one shift since 1914 and that the man was hired with the distinct understanding that his position was to pump whatever water was necessary for the station requirements at this point, and that beyond this requirement he has enjoyed the privilege of devoting his time as he desired. He has no manual labor to perform as the pumping equipment was operated by oil engine. He is required to oil and keep the equipment clean and clean out the pumping station but is not qualified or required to make repairs to machinery. The Labor Board decided that the employee was properly compensated and denied the claim of the employees. (Decision No. 1129.)

Dismissal of Bridge and Building Employees for Refusal to Work Overtime in an Emergency at Pro Rata Rates Sustained

About 7:15 p. m., on July 29, 1921, 645 ft. of double track trestle on the Stockton division of the Southern Pacific near Banta, Cal., was found on fire and 135 ft. was destroyed before the fire was extinguished. It was necessary to call men from adjoining divisions to restore the trestle and track as promptly as possible. Foremen and men were brought from the Sacramento division, arriving at 9:00 a. m., on the following day. These men worked until 4:00 p. m., when they returned to their outfit cars and refused to perform further service at the pro rata rate, notwithstanding the fact that an emergency existed, for which action they were discharged from the service. In a decision upon a protest registered by the United Brotherhood of Maintenance of Way Employees and Railway Shop Laborers the Labor Board decided that the management was justified in the action taken in this case and denied the request of the employees' organization for the reinstatement of the men. (Decision No. 1118.)

Labor and Material Costs Compared*

THE following data on general maintenance of way performance, both in regard to a comparison of labor and material costs as well as service performed by man hours, are taken from records over a period of 20 years for a total trackage of about 8200 miles. They apply to the actual performances and do not include any charges or adjustments or journal entries which may have been made by the auditor.

From 1902 to 1905 inclusive, the total labor payroll charged to maintenance of way accounts averaged about $4,500,000. The following two years it gradually grew and then there was a decided increase beginning with federal control that continued until it reached a maximum in 1920 of $12,800,000. In the past two years it has started to decline. In the case of the material charged to maintenance—for the years 1908 to 1917 inclusive, the weighted average was about $3,500,000 per year, and beginning with federal control this gradually increased until it reached a maximum of approximately $9,000,000.

Our cost of labor and material performance from 1908 to 1916 inclusive averaged 55.4 per cent for labor and 44.6 per cent for material. During federal control this changed to from 65 to 68 per cent for labor and from 32 to 35 per cent for material. A very interesting study

*Abstracted from a talk by J. V. Neubert, engineer maintenance of way, New York Central, Lines East, before the Metropolitan Track Supervisors' Club, at New York, on August 12, 1922.

shows the turnover in 1921, when the railroads were paying a much higher prevailing rate than the supply of men called for, with the result of their having practically all the material available ahead of them and working a small force. The labor ran 49 per cent and the material 51 per cent. By consolidating the labor and material costs of maintenance for a mile of territory we find that from 1908 to 1917 inclusive the average was about $2800, whereas during federal control this increased until it reached a maximum of $6300.

The average earning power of all men in the maintenance of way department was 20 cents per hour in 1915, 20.6 cents in 1916, 21.6 cents in 1917, 48.2 cents in 1918-1919, and reached the high point of 51 cents in 1920. By placing costs in terms of man hour service for maintenance we find the weighted average man hours for a mile of track per month, for maintenance only. In 1915 this averaged about 275; for 1916-1917, 285; 1918, 245; 1919, 240; 1920, 260 and 1921, 185. The record of man hour service performance by months shows that the maximum force is employed in August and September but in some years July and October are added. In 1919 the man hour service varied from 190 man hours per month to 305 man hours per month, which represents the fluctuation in labor conditions and also the application of various orders and decisions, and this was also true in 1920.

A Problem in Salvaging Railway Track Materials

AN IMPORTANT item of the railway division of the flood control work nearing completion in the Miami Conservancy District, Dayton, Ohio, has been the work of salvaging the track materials in the lines abandoned pursuant to relocations made in that section. The extent of the work is indicated by the fact that the total length of the relocated lines is some 50 miles. Tracks of the Baltimore & Ohio, the Big Four, the Erie and the Ohio Electric, have all been relocated, and the total value of the net salvage will exceed $330,000, of which $320,000 worth was effected prior to November 15, 1921.

On the old line of the Baltimone & Ohio, the salvaging of both rails and ties was done with the forces of this road, a work train and crew of 20 laborers having been provided for the purpose. The work train consisted of a locomotive, a box car for ties, a steam derrick car and a flat car for rail. The operation of salvaging consisted of picking up both the ties and rail as the train proceeded down the line, the spikes being pulled by a claw bar and the track bolts cut by chisel and sledge. This method made it possible to complete the salvaging in one trip but it had the disadvantage of requiring all ties to be carried by hand past the rail and derrick cars for the purpose of loading them into the box car. The bridges, which on this line were of the deck plate girder type, were salvaged by a wrecking crane, the rivets first being cut and the bridge members separated, after which they were loaded by derrick onto flat cars. Of the material salvaged, the Baltimore & Ohio itself purchased the rail and track fastenings and the 8,000 ties capable of three or more years of service. Of the 20,000 ties remaining, 14,000 were used in connection with the construction of a dam in the section and the remainder destroyed as valueless.

The rail and ties on the Big Four line were also salvaged by company forces and equipment. Unlike the Baltimore & Ohio's method, however, only the rail was recovered on the first trip over the line, the ties being picked up later. In reclaiming the rail it was originally planned to depend upon a crane traveling under its own power, but this practice proved so costly on account of the slow progress made by the machine that the method was discontinued for that used earlier on the Erie and described in the next paragraph. The bridges on this line were not salvaged, all but two of them being old fashioned flat top masonry culverts spanned by a single concrete slab reinforced with old rail. Of the material which was salvaged the rail was purchased by the Big Four with the exception of four miles at one end which was left untouched to serve as an industry track, and the 28,000 ties in the old line were sold to various firms in the vicinity of Dayton.

Unlike the method employed on the Baltimore & Ohio and Big Four, the work of salvaging on the old line of the Erie was done by a contractor to whom were sold all of the rail and track fastenings together with all the bridge steel in the line with the exception of that in two truss bridges. Owing to the fact that all of the ties were in bad condition, none were sold, about 30 per cent of the total being used in connection with the flood control work.

In salvaging the Erie rail an attempt was made at the outset to economize by cutting the bolts with a pneumatic chisel driven by a gasoline air compressor in the tool car behind the locomotive (no self-propelled apparatus being available), but the cost of the attending work train exceeded the benefit of the faster cutting pneumatic machine and the method was abandoned. The bolts thereafter were cut by hand with a chisel and sledge by a gang working ahead of the work train in the same way as was done on the Baltimore & Ohio and the Big Four lines.

All the bolts were removed except the two nearest each rail joint, which were left in place with the heads cut, to help hold the track in line for the work train. The rails were held also by leaving three inside spikes to a rail, one at each end and one in the middle, all others being removed by the gang. The work train followed the working gang removing the remaining bolts and spikes in the track, picking up the rails by hand and sliding them endwise onto two flat cars ahead of the locomotive, the latter operation being facilitated by a "dolly" on the front end of the front flat car, a detail which was also a feature of the work on the B. & O. and on the Big Four after its trial of the traveling crane. The cost of salvaging rail by this method varied from $4 to $6 a ton.

The bridges, except two truss structures, were single span deck and plate girders, the largest of the latter being 100 ft. long. In removing this the bridge was first jacked up on crib work placed under the center of the span, until the bottoms of the girders cleared the top of the track rails on the adjacent roadbed. Greased rails, resting on blocks, were then laid on each side of the track, and parallel with it, so as to form a broad gage track with the rails in line with the mid-line of the bridge girder and extending to the center crib work. The bridge was then pulled endwise along the greased rails by the work train locomotive until it could be placed on the ground.

An stated previously, the total net salvage on all the lines will exceed $330,000, making it one of the biggest jobs of the kind in several years. The cost of the salvaging will be about 15 per cent of the gross value. The entire work was carried on under the general supervision of Albert Larsen, division engineer in charge of the railway relocation for the Miami Conservancy District. We are indebted for the above information to G. L. Teeple of the Conservancy District engineers.

WHAT'S THE ANSWER?

This department is an open forum for the discussion of practical problems of maintenance of way and structures. Readers are urged to send in any questions which arise in their work in the maintenance of tracks, bridges, buildings and water service. The *Railway Maintenance Engineer* also solicits the co-operation of its readers in answering any of the questions listed below.

The following questions will be answered in next month's issue:

(1) When applying rail anchors should they be concentrated opposite the joints or distributed throughout the length of the rail?

(2) What is the safe working load on the ordinary sizes of hemp rope of the grade commonly used on hoisting equipment?

(3) What are the relative merits of "spot" surfacing of track as compared with the more thorough surfacing "out of face" at intervals of two or three years?

(4) What is the best rule for determining the bearing power of piles?

(5) To decrease or prevent corrosion should hot water heating systems be emptied in summer or kept filled with water, or should the water be changed at intervals?

(6) How should the size of the air chamber for a pump be determined and what should be the relation between the height and diameter when made out of a piece of pipe?

(7) Should wood block floors be laid with a sand cushion or, if laid directly on a concrete base, is a layer of pitch or other adhesive material desirable?

(8) What precautions should be taken to prevent the deterioration of fire hose attached to standpipes in buildings?

Sheet Metal as a Fire Protection

Does sheet metal covering offer an effective fire protection for wooden bridges?

First Answer

In my opinion it does if properly designed and maintained. Our standard practice is to cover the ties between the fenders, running galvanized iron about half way up the fender to prevent cinders from lodging on the tie against it. This method is effective except in lignite burning territory. There it is necessary to cover the entire fender and the ends of the ties to the level of the top of the stringers, because we find that sparks are drawn underneath the galvanized iron, between the ends of the ties, by suction. In this territory we also cover the ends of the caps and tops of sway bracing outside of the stringers as well as the entire exposed area of the bulkhead, both front and back. We consider the covering of the bulkheads to be a very important detail, as the origin of many of our fires is at the ground line of the bulkheads, where the timber has become somewhat decayed and the sparks can easily lodge against it. After the bridges are covered in the manner described it is essential that the joints between the various sheets of galvanized iron be kept firmly nailed down so that sparks will not enter through them.

After an unusual number of fires on structures having galvanized iron decks about three years ago, we started a campaign to secure the proper maintenance of these decks, which has had remarkable results.

One way of eliminating trouble from these open joints is to cover the galvanized iron deck with a thin layer of crushed rock or gravel which will catch the sparks before they pass into the joints. We only recommend this practice, however, where the bridge and galvanized deck are to be replaced within the next two or three years as the stones work under the rail, causing destruction of the galvanized iron sheeting in about that time.

G. A. HAGGANDER,
Bridge Engineer, Chicago, Burlington & Quincy, Chicago.

Second Answer

If the sheet metal covering is properly put on and maintained, it will be a very effective protection against fires from dropping coals or cinders from passing engines. It will not, however, protect pile or frame trestles against fires which are communicated by burning grass or any other way from the ground. However, a very large majority of the fires on wooden bridges may be ascribed to the first cause. To be most effective, the sheet metal covering should be placed on top of the ties, and extend entirely over the deck. This also serves as a protection against the weather, and ordinarily will increase the life

of the caps, stringers and ties of wooden bridges.

One disadvantage of a tight metal covering is the difficulty in inspecting the parts of the trestle under it, especially if the trestle is so high that these parts cannot be seen readily by a man standing on the ground below. One difficulty in maintaining a sheet metal covering is due to salt brine dripping from refrigerator cars, where many of these cars pass over the trestle. On lines where there are few or no refrigerator cars and no salt brine dripping, a sheet metal covering, if properly put on, should last many years. For this purpose, galvanized iron of No. 18 or 20 gage is sufficient, and can be perforated readily for track spikes. The sheet metal covering should be placed with a lap of two to three inches at the joints, and nailed to the ties, to prevent shifting, or its being moved by wind or passing trains.

R. H. REID,
Supervisor of Bridges, New York Central, Cleveland, Ohio.

Third Answer

A metal covering on wooden bridges is an effective fire protection so far as preventing fires from live coals dropped from coal burning locomotives. This is proved from the fact that of the 15 or 20 fires occurring on wooden bridges under my supervision during the past 10 years, none occurred on bridges having metal coverings.

A. S. CLOPTON,
Supervisor, B. & B., Missouri, Kansas & Texas, Oklahoma City, Okla.

Fourth Answer

My experience is that a sheet metal covering does not offer an effective or satisfactory fire protection for wooden bridges. I have found that small animals and birds will build nests underneath the metal covering and the rubbish from which these nests are made and which is hidden under the sheet metal burns very quickly if any spark or cinder gets at it through a crack or opening in the metal. It is also my experience that the fighting of a fire in this rubbish is seriously hindered by the sheet metal cover, so that if a fire once gets started it is very hard to put it out. THOR MONRAD,
Section Foreman, Northern Pacific, Dickinson, N. D.

Heat Exhaustion

What is the proper method of giving first aid to a man overcome by the heat?

"Though this condition (heat exhaustion) is caused and prevented in the same way as sunstroke, it is really quite different from it. Heat exhaustion is just what its name states—exhaustion or collapse due to excessive heat.

"Symptoms—Often begins with dizziness, often nausea and vomiting. Great depression and weakness but not really unconsciousness that cannot be aroused. Face pale and covered with clammy sweat but sometimes flushed and hot but never with the great heat that characterizes sunstroke. Breathing shallow. Pulse weak and rapid.

"Treatment—Send for doctor. Remove to cool place and have patient lie down in most comfortable position with clothing loosened. No cold externally, but may sip cold water. Stimulants, as tea, coffee, or aromatic spirits of ammonia."

—From American Red Cross, First Aid (2nd edition—Industrial) p. 107.

"In heat prostration, with cool skin, weak and rapid pulse, stimulants and friction are required. Give stychnine sulphate, one-fortieth grain, rub the surface of the body and the extremities, place hot water bottles to the feet, and cover the body with blankets. If the head is hot, apply cold water to the forehead. If vomiting occurs, inject hot salt solution (one teaspoonful of salt to a pint of water) into the rectum. Apply a mustard plaster over the region of the stomach. Mustard plasters may also be applied to the feet."

—From U. S. Public Health Service, What to do in accidents. p. 40.

[The answers given above were supplied by the Library of the National Safety Council.]

Soldered Wire Splices

Why should electric wiring splices in buildings be soldered?

First Answer

Splices in electric wiring systems in buildings should always be soldered for unless this precaution is taken there is likelihood of the joint becoming a fire hazard. Splices in a conductor should not, however, depend upon solder for conductivity. The joint should be strong mechanically and sound electrically before any solder is applied to it and then the solder should be applied sparingly. While there is no doubt that joints can be made sound electrically without solder, there is always the possibility that splices of this nature may become loosened in time. When this occurs the splice offers an increased resistance to the passage of a current through it and if the circuit is heavily loaded, sufficient heat may be developed to set fire to the insulation and subsequently to the building.

Trucking Floors

How should the timber be laid in a trucking floor with reference to the direction of the trucking?

First Answer

Smoothness is one of the most desirable qualities to be realized in the design of a trucking floor. In a timber floor, this can only be secured by laying the surface floor in the direction of the trucking. A timber floor, which will be economical to repair, to prevent deterioration of equipment, to speed up trucking operations and to insure a maximum life can be constructed with a sub-floor of pine or cypress overlaid with a wearing surface of tupelo, gum, maple, or other suitable hardwood, end matched and face nailed. The sub-floor should be laid at right angles to the direction of trucking and the surface floor parallel to it. The surface floor should receive all of its wear lengthwise and not across its face.

Second Answer

We always lay floor plank in the direction of the trucking, that is, in our freight houses we lay it lengthwise of the house, as the majority of the trucking is in that direction. We have had hard maple floors laid in this way in our State Street out-bound freight house and our Wood Street transfer freight house in Chicago that have been in place for 25 years. J. S. ROBINSON,
Division Engineer, Chicago & North Western, Chicago.

New Joints on Old Rails

Is the practice of applying new joints to old rails in the track to be recommended? What are its advantages?

First Answer

The practice is justified where the rail is not greatly worn and the old joints are inferior, either through defects in their manufacture or having become so through inadequate maintenance. As the latter has been the rule rather than the exception of late, it would seem that the renewal of the splices is to be recommended in a great many cases. At least the writer has seen a vast amount of this repair being practiced.

Many men have told me they get excellent results from the application of new splices to old rails. One foreman

told me that a stretch of track, in which he had renewed the splices out of face, had required practically no attention through a year, although formerly surfacing was necessary every few days. I know of a 2-deg. 30-min. curve on a railroad of the highest standards of maintenance, which had new splices applied throughout to 130-lb. rail, with results in improved maintenance immediately noticeable. It may be stated as pertinent to this inquiry that on this particular road the practice is general of employing new joints whenever relayer rail is being laid in a running or other heavy service track.

I think all will agree that renewing with new splices, essentially for the object of improving maintenance conditions, should not be practiced when the ball of the rail is worn down so much that wheel flanges will shortly be riding upon the reinforced head of the splices of the types in such common use today. It is proper also to sound a warning that renewals of this character require close supervision, as rail failures, occurring generally at the second bolt hole, have resulted in several instances. The strain put upon the rail, when the bent ends have been forced straight by the application of a joint nearly as strong as the rail itself, must be obvious to all.

In general, then—where the joints have worn to an extent preventing a close fit within the fishing space, or have become depressed at the middle, preventing the proper surfacing of the joint, or so worn in the bolt holes as to make a tight joint impossible, and the rail is still in the condition of first class relayer rail, by all means apply new joints.

As to the specific advantages of the new splices with the old rail, the opinion is virtually unanimous that decreased maintenance is shown, as well as a specific improvement in surface conditions. Much wasted labor is saved in the attempt to keep the old joints tight, quiet riding joints are obtained, and the injurious effects upon equipment are reduced to a minimum.

W. F. RENCH.

Second Answer

This is good practice and in my opinion is to be recommended. My first experience was in 1900 when a branch line, 13 miles in length laid with 60-lb. rail which had been in use a number of years, was entirely renewed with new joints applied to the old rail. Since that time I have seen a great deal of 75-lb. and 80-lb. rail treated in like manner and results justify the above opinion.

The new joints make it possible to keep bolts tight and therefore the rail joints may be maintained in good surface thereby improving the riding of the track, decreasing the amount of labor expended in keeping up joints and in fact, prolonging the life of the rail in the main track. When the rail is finally taken out of the main track to be relaid on light traffic branch lines or sidings, the joints, being in good condition, can be applied with the rail and under the new conditions will last as long as the rail lasts.

J. G. BLOOM,
Engineer, Maintenance of Way, Chicago, Rock Island & Pacific, Chicago.

Adjusting the Speed of Pumps

Where it is desired to reduce or increase the speed of a belt driven pump a certain amount and this can be done only by increasing the size of the pulleys, how may the amount of the increase be determined?

It is understood in this problem that the driving pulley is called the "driver" and is the pulley on the motor or engine. The driven pulley is called the "driven" and is the pulley on the pump. If the number of teeth in gears is used instead of the diameter in the following rules, number of teeth must be substituted wherever diameter occurs:

To find the diameter of the "driver" when the diameter of the "driven" and its revolutions, and also the revolutions of the "driver" are given; multiply the diameter of the "driven" by its revolutions, and divide this result by the revolutions of the "driver."

To find the diameter of the "driven," when the revolutions of the "driven," also the diameter and the revolutions of the "driver" are given; multiply the diameter of the "driver" by its revolutions, and divide this result by the revolutions of the "driven."

To find the revolutions of the "driver" when the diameter and revolutions of the "driven," and the diameter of the "driver" are given, multiply the diameter of the "driven" by its revolutions, and divide this by the diameter of the "driver."

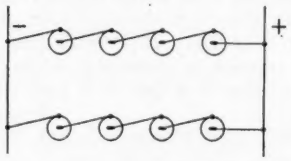
To find the revolutions of the "driven," when the diameter and revolutions of the "driver" and the diameter of the "driven" are given, multiply the diameter of the "driver" by its revolutions, and divide this by the diameter of the "driven."

F. D. YEATON,
Assistant Engineer of Water Service, Chicago, Milwaukee & St. Paul, Chicago.

Batteries for Gas Engines

Where two gas engines in a pumping station, each with its own set of batteries, are so located as to permit consolidating the two sets of batteries, is it good practice to do this, and if so, how should they be connected?

The consolidation of these batteries would have the effect of increasing their voltage slightly and would, in turn, result in a slightly more uniform spark, especially if the engines are not operated simultaneously. In a



Manner of Combining Two Sets of Batteries

consolidated battery, both sets will exhaust at the same time. I consider it good practice to consolidate batteries, where it can be done conveniently. To consolidate the sets, first, make sure that you have the same number of cells in each set. They should then be connected up, as shown.

P. A. GARRITY,
Western Sales Manager, Thomas A. Edison, Inc., Chicago.

Damaged Bridge Steel

What investigation, if any, should be given to structural steel which has dropped while hoisting, or fallen from a car, to determine whether it may be safely used as originally planned?

If I were to have a proposition to handle steel of the kind mentioned I should want to go into it very thoroughly. In the first place, one should be guided by the importance of the member. If it is a minor member one might possibly be able to overlook apparent damage and repair the piece in the field. If it is a girder or any other important member, a very thorough investigation should be made to ascertain the amount and extent of the damage. Usually a member of this kind will show some point of damage; it will either be out of line or possibly slight cracks will show at the point where the greatest damage is indicated. The paint should be taken off from this

point and a careful investigation made to see whether or not any cracks have developed. It might possibly be a good thing to cut out the rivet holes, and if they have I should say then that the point in question should be spliced, or the injured parts taken off and new ones substituted. It does not give one a very strong feeling of security to put up a new structure where any of the important members show signs of damage.

I have known of badly bent members, that were sent back to the bridge company where they were straightened and put back in the structure, and which have been giving good service for 10 years. However, these particular members were given a very thorough inspection and the officers were satisfied that if they were properly straightened they would be as good as new. I do not believe that any one can lay down a hard and fast rule for handling work of this kind. It is necessary to take up each individual case by itself and determine the amount of damage and the method of handling it.

I. L. SIMMONS.
Bridge Engineer, Chicago, Rock Island & Pacific, Chicago.

Further Answers to Old Questions

Preventing Fires in Creosoted Timbers

The best method of protecting creosoted material stored along the tracks from fire, is to have the ground on which the ties, timber, and piling are placed, thoroughly cleared of grass, weeds, or any inflammable trash, not only immediately under the material but for four or five feet from it. The only important origin of fire is from the ground. I do not believe that further protection is necessary or economical. The creosoted material should be piled directly on the ground and not put on bed pieces with an open space beneath the pile. The closer the pieces are placed together, the better protection there will be from fire.

Some roads cover creosoted timber, piling, and ties with dirt but the danger from locomotive sparks is so small that it is not economical to go to this expense. I have known of freshly creosoted material catching fire, presumably from engine sparks, but this does not often occur. In nearly all treating plant yards where creosoted material is stored, switch engines and traveling derricks pass large piles of creosoted material at frequent intervals, but fires at treating plants from sparks are not at all common. E. H. BOWSER,
Superintendent, Ties and Treatment, Illinois Central, Memphis, Tenn.

Putting Out Fires in Creosoted Timbers

The best way to put out a fire in creosoted lumber, piling, or ties is to use water. If water is not available and shovels and dirt are at hand, the fire may be put out by casting dirt on the burning timber. The same methods apply to untreated timber. It is a mistake to think that water has not the same effect on fire in creosoted material that it has on fire in uncreosoted material.

In my experience if creosoted material has been seasoned for some time after treatment, a fire is more easily extinguished than it is in dry Southern pine, untreated. It is practically impossible to put out a fire in a large stack of seasoned pine lumber after it has gotten a good start, but it is not impossible to put ot a fire in creosoted lumber.

I once saw a stack of heavily creosoted piling, of which half of the stack was burned badly, and the other half was not injured. This stack was of 40-ft. piling and was about 30 ft. wide at the base, with the top piling about 15 ft. above the ground. The fire began at one end, being communicated from an adjacent stack and was stopped in the middle of the piling by water from the fire hose. The half that was burnt was badly charred but was not burned up. The fire was under full headway when put out.

When creosoted timber burns, the first blaze is from gas formed by the heat vaporizing the creosote oil and for a time this gas burns without charring the wood. When the gas stops coming out of a burning piece of creosoted timber or piling, the fire will almost invariably go out unless there is a blaze from an adjacent pile of timber to keep it going. E. H. BOWSER,
Superintendent, Ties and Treatment, Illinois Central, Memphis, Tenn.

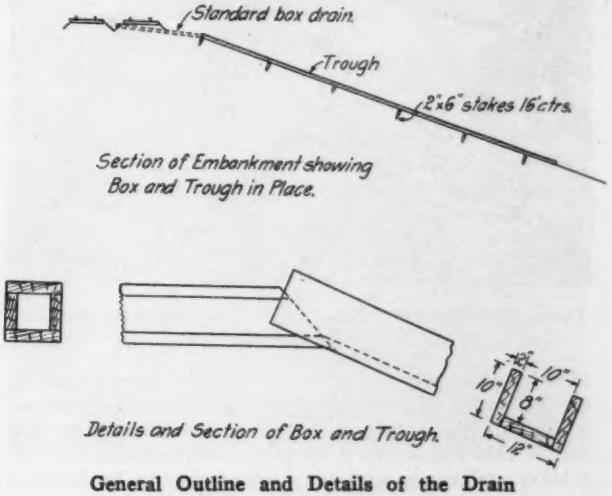
Cutting Rail in Track

In my opinion the easiest, quickest and safest way of cutting a rail to any length desired without removing it from the track is as follows: Mark the rail with a track chisel on the outside from the base to the underside of the head, making only a small cut. Then have three men set the Jim Crow on the inside of the rail and when they turn up the wrench of the Jim Crow the rail will be broken in a short time with a smooth cut. The use of track jacks for cutting rail is poor practice and dangerous. R. ROSSI,
Section Foreman, Belt Railway of Chicago, Chicago.

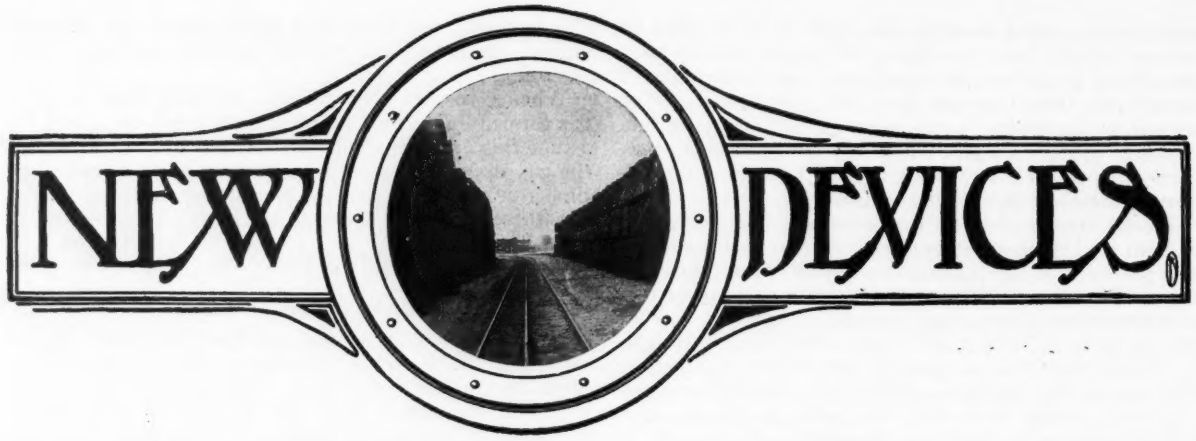
Draining a High Embankment

THE Illinois Central has recently installed a number of drain boxes on the slope of a high embankment on its main line south of Terry, Miss., which have greatly improved maintenance conditions at that point. This embankment was built of material which had caused a great deal of trouble by sliding from time to time. To overcome this condition the material which was sliding was replaced with more stable earth and the slopes were flattened.

In order to prevent water from seeping into and saturating this material it was necessary to remove the water as soon as it fell. For this purpose small wooden drain boxes were installed at intervals of 150 ft. along the bank, the boxes extending from the center ditch between tracks out to the shoulder and down the slope of the embankment to natural ground. Sixteen of these drain boxes have been installed in this fill. These boxes are formed of two-inch material and are 10 in. square in outside dimensions under the track. Beyond the shoulder the water is conducted down the face of the slope in a trough 10 in. wide.



General Outline and Details of the Drain



Removing Concrete Walls With An Air Operated Paving Breaker

RAILWAY maintenance forces are sometimes required to tear down old concrete or other masonry under conditions that do not permit the use of explosives, and in such cases the ordinary rotating rock drill with which the holes are ordinarily made for the placing of the charges is not a very effective tool. Better results

These Two Breakers Tore Down Two Walls 51 ft. Long in Seven Days

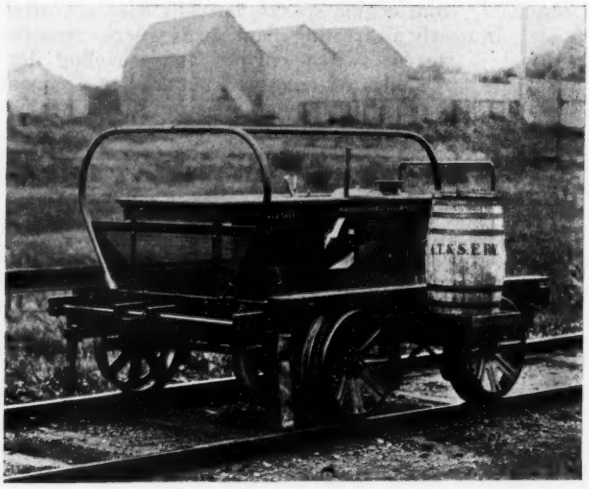
have been secured with a compressed-air operated paving breaker, or in other words a pick and chiselling machine, which is similar to a non-rotating hand-hammer rock drill. This equipment is simple of construction and operation and when working downwards can be handled by one man or by two men when making horizontal cuts.

Until lately paving breakers have been used principally for tearing up pavement of all kinds, but they were applied recently with effectiveness and economy in the destruction of the reinforced concrete walls and slab of a pipe tunnel in a building at Cleveland, Ohio, as shown in the photograph. The paving breakers not only broke up the concrete in pieces of a size convenient for handling but were also used to cut off the steel reinforcing bars. The photograph shows the breaker at work on one of the side walls of the pipe tunnel. They were 51 ft. long, 10 ft. high and 12 in. thick, reinforced as illustrated. The two walls were entirely removed by the two breakers in 7 days; the roof was removed in 3½ days.

The paving breaker is practically the same machine as the spike driver. By the removal of two nuts the front head can be taken off and a spike driver front head put in its place, this being the only part in which the two machines differ. The change may be made in a few minutes' time. These paving breakers are manufactured by the Ingersoll-Rand Company, New York City.

A New Design of Motor Car

THE ATCHISON, Topeka & Santa Fe has recently adopted as standard for section use, a modified design of the Fairmont motor car which embodies several novel features, most of which are shown in the illustration. Conspicuous among these developments is a safety railing enclosing the front end of the car and extending



Side View of the New Car

lengthwise across the top, this railing, as the picture shows, being equipped with a front end screen and bending inwardly at the base to allow rails to be placed on the running boards at each side. As a means of closing the opening on the front end of the car left by the railing, front end gates of metal and of the same height as the front end screen are hinged to the railing on each

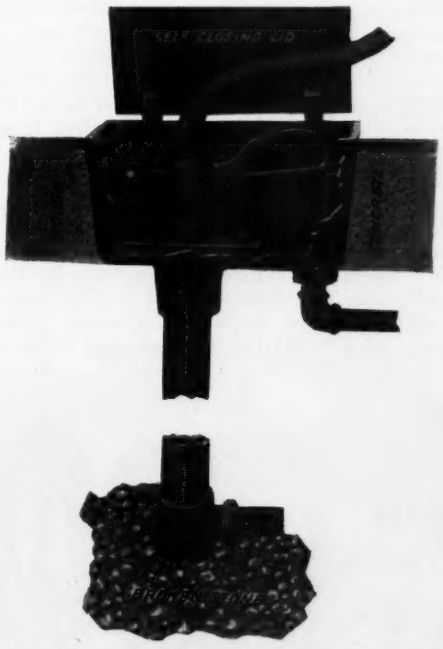
side so that they may be swung into position and locked when desired. As the illustration also shows, footboards are provided to cover the wheel tread and the car is equipped with hose sweeps on the front end to prevent any objects passing under the wheel which might cause derailments.

The car is also equipped at each end with a lift pipe to facilitate its removal from the track and is provided with five Hyatt roller bearings, three of which are carried on the drive axle, the fifth being located close to the drive pulley. No loose washers are used on the axle, the use of washers being rendered unnecessary by two split collars which are clamped to the axle with set screws, these collars affording adjustment as well as eliminating the end thrust on the wheel hub. The brakes on the car incorporate adjustable toggle links, which permit the brake shoes to be used until practically worn out.

The car is a six horse power machine manufactured by the Fairmont Gas Engine & Railway Motor Car Co., Fairmont, Minn.

An Improved Water Service Box

AMONG RECENT developments in equipment of interest to railroads is a railway water service box for use at coach tracks or other outside points where it is desired to maintain a two duty hydrant for use in filling or flushing work. This device is known as the



A Sectional View of the Safety-First Water Box

Murdock Safety-First Water Service Box and is represented by the manufacturers, the Murdock Manufacturing & Supply Co., Cincinnati, Ohio, to be an improved form of a self-closing hydrant which the company has manufactured for several years.

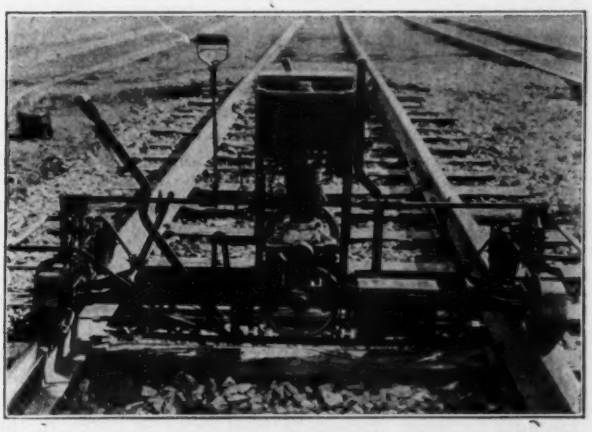
As such the device consists specifically of a heavy cast iron box 13¾ in. long, ¾ in. wide and 5¾ in. deep, which is fitted with a self-closing cast iron cover and is mounted on the upper end of the hydrant unit in such a way as to provide an enclosure for the hose connection and also for the valve lever. The hydrant itself is of a non-freezing type by virtue of a construction whereby any water running into the valve box or remaining above the valve proper, when the latter is shut off, drains away through a special drain hole provided in the bottom of the valve box and through drain holes in the bottom piece of the hydrant.

The water is turned on by raising the valve lever instead of pushing it down as in earlier types, and this lever is held open after raising by resting it on a lug in the side of the valve box. The design of the hydrant valve, however, including as it does a heavy phosphor bronze spring put into place under strong compression, is such that upon releasing hold of the lever it is forced back into a completely closed position with no chance of leaking arising from carelessness in operation or from the effect on the valve of the jarring action of passing trains. Aside from preventing leakage of water, this construction also facilitates the quick operation of the hydrant, the only operation required being that of lifting the handle and shifting it to the right until it rests on the lug.

As the illustration suggests, the water box is designed for its installation flush with the ground as a safety precaution. The hydrant delivers a 1-in. stream of water, is so designed that all working parts may be removed without digging up the main fixture and is adapted to the use of standard air hose couplings to effect quick connections with hose lines. Prior to the company's placing this device on the market, a test box was maintained at the Cincinnati terminal of the Pennsylvania for about a year and another in the Washington, D. C., terminal of this company for a period of about seven months.

Gas Engine Driven Bonding Drill

A POWER drill driven by a gasoline engine to be used for drilling holes for signal bonding has been invented recently by J. J. Lonsway of Fostoria, Ohio. The device is designed to drill the rails for either $\frac{9}{32}$-in. or ⅜-in. holes. When in the drilling position, the main frame of the machine rests on the rails and the center lever is arranged to raise the frame up, leaving the entire weight on the wheels for moving the machine forward along the track to the next joint. A small gasoline engine mounted in the center is geared through clutches to the main shaft which operates the drills. The drill is fed through the rail by means of a lever on either side. By using a drilling unit on each end of the machine both rails may be drilled as the joints are reached without handling the machine from one rail to the other. It is claimed that 80 to 100 holes can be drilled in one hour with this new machine. As the frame is insulated



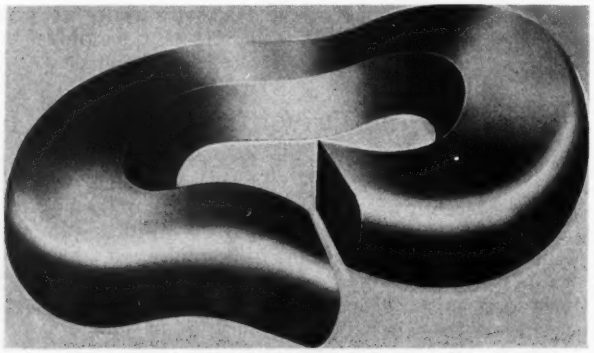
Lonsway Power Track Drill

from the rails it will not shunt the track circuit when drilling holes to repair bonding or when rails are changed out. The truck is readily detached from the frame, making it convenient to carry the machine on a motor car or a hand car.

A High Strength Lock Washer

THE FLEXTURE of rails under traffic tends to force the joint bars apart. The pressure thus exerted is resisted by the bolts and while there is no simple method of calculating the stress imposed on the bolts by this action, tests have shown that the spreading force may be as much as 26,000 lb. for each bolt. The latest data on this subject were reported in the *Railway Maintenance Engineer* for August, page 279. Bolts of adequate size to hold the bars in place are readily provided but the difficulty is to keep them tight. Disregarding the possibility of nuts backing off or of "stretching" the bolts, it is commonly accepted that the real reason for the loosening of bolts is the gradual adjustment of the joint bars to a closer fit on the rail as the irregularities or fins on the fishing surfaces are worn down in service.

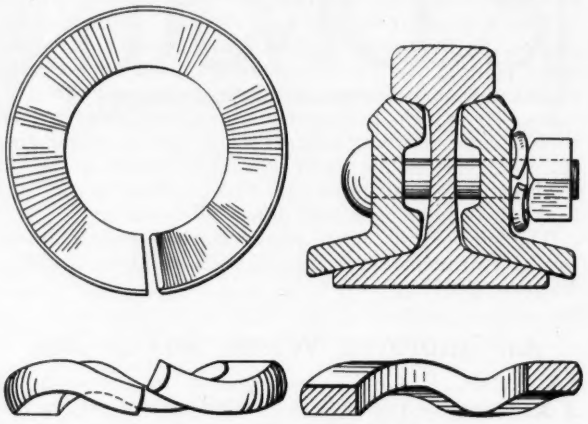
One way to overcome this is to introduce a lock washer between the nut and the face of the bar. These are, in



The "Improved Hipower" Washer

effect, simple coil springs so designed that they are compressed in wrenching the nut and then as the bars take a closer fit on the rail the springs expand under the nut and continue to hold the bars snuggly against the rail. If, however, these washers are not strongly reactive they cannot resist the separating action of the bars that takes place when wheels pass over the joint, so the bars will simply force the washer flat and will continue to move in and out almost the same as if no lock washer were present.

Of course, until recent years, there has been no definite information as to just how much spreading force was exerted by the joint, but from the results of tests now available it is known that stresses of considerable magnitude occur. A study of these facts has naturally led to efforts to design lock or spring washers with sufficient strength to resist stresses as high as those noted in the tests. The latest effort in this direction is the "Improved" Hipower Lock Washer, manufactured by the National Lock Washer Company, Newark, N. J., in which the simple spiral is replaced by a succession of undulating curves producing a series of springs. Washers of this design can be made exceedingly stiff and have been subjected to tests which show that they can readily be designed to resist complete flattening under the pressures to be encountered in service on rail joints. By suitable selection of stock and variation in heat treatment a wide range of strength and flexibility is possible from which the most practicable limits have been selected for the service to be rendered. To insure uniformity of product, the washers are normalized after fabrication and each washer is subjected to a test compression. Lock Washers of this type have been subjected to actual service use for the last 18 months with results demonstrating the

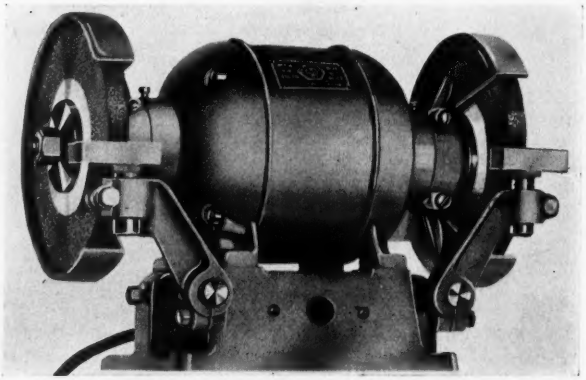


Details of the New Lock Washer

advantage of lock washers fully capable of resisting the high stresses imposed on them in service. One of the effects noted has been a condition of much more uniform tightness of the joints than it was possible to obtain by a periodic wrenching of the bolts. At the present time over 700,000 of these washers are either in the hands of the railroads or being fabricated on orders from them.

A New Electrical Grinder

A NEW grinder with two wheels mounted on the same shaft with the armature of an electric motor has been placed on the market recently by the Black & Decker Mfg. Co., Baltimore, Md. The motor is not universal but may be furnished for either direct or alternating current at 110 or 220 volts and if for alternat-



A Wheel Is Mounted on Each End of the Shaft

ing current in either 40 or 60 cycle. A toggle switch, easily operated by a throw to the left or right, is mounted in the base of the machine.

The wheels are 8 in. in diameter with a ¾-in. face, operating at a no-load speed of 3600 r.p.m. Each wheel is supplied with a wheel guard covering approximately three-fourths of the periphery. Tool rests, adjustable in two directions assist in grinding various tools or parts.

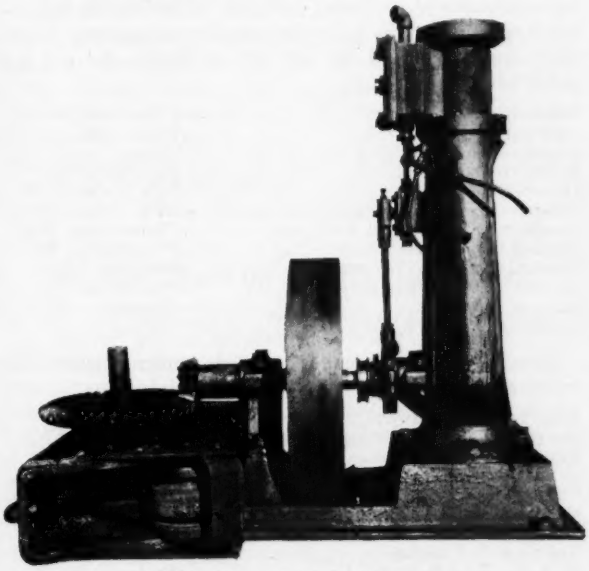
Making One Dollar Do the Work of Two

Hints That Help

Ways That Win

Economy in a Home Made Rail Bender*

THE ST. LOUIS division is approximately 40 per cent curves between St. Louis and Eldon, Mo. During the past summer 15 miles of 90-lb. rail was laid, releasing 80-lb. rail. To lay this rail it was necessary to curve a considerable portion of it. For this purpose the power rail bender shown in the accompanying illustration was made. By use of this device the unit cost of curving rail was reduced to 41 cents. The significance of this is apparent when it is stated that with a hand rail bender, using man power, the unit cost of bending rail was $1.50.



A Side View of the Rail Bender

The bender consists of two pieces of ½-in. steel plate 24 by 36 in., between which are set one fixed and two movable 10-in. steel rollers formed to fit the section of the A. R. E. A. 90-lb. rail. On top of the fixed roller is set a 36-in bevel gear attached to the steam engine by a shaft and small gear.

The operation of bending rail with this device involved the employ of a foreman and 13 men. With the bender located on a flat car the operations consisted of pulling rail from the stock car as it came from the mills and shifting it into position with the aid of a gin pole. With everything in good working order, a rail 33 ft. long was curved in 10 sec. The proper curvature is provided for by adjusting the movable roller.

The various items of expense entering into the machine and the character of its performance are as follows:

1 9-hp. upright steam engine (second-hand from St. Louis scrap dock)	$ 135.00
Store expense on same	8.10
1 10-in. engine axle, 3,100 lb	62.00
1 bevel gear and miscellaneous connections for setting and connecting up engine	43.41
Labor cost, including all experimental work (work done by company force)	517.21
Total	$ 765.72
1,209 rails curved at a cost of	$ 494.83
1 rail curved at cost of	0.41
1,209 rails if curved by hand	1,813.50
Saving on year's cost curving rails	$ 552.95

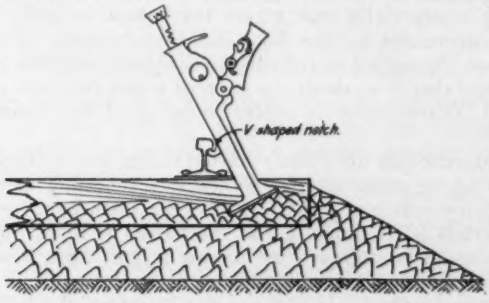
*From an article by G. A. Carroll, division engineer, Rock Island Lines, appearing in the Rock Island Magazine.

To Keep the Track Jack from Slipping

By C. S. Lusk

Section Foreman, Erie, Alfred, N. Y.

IN THESE DAYS of heavy rail and ballast shoulder and of small section gangs, it is customary to line the track by means of the track jack. The jack is set up against the rail in a tilted position with the toe of the lifting rest under the head of the rail so that the track can be lifted and pushed at the same time. With the jack in this position, however, the toe slips out from under the head of the rail about as many times as it holds fast. To prevent this slipping, I file a V-shaped notch ¼ in. deep in the toe of the lifting rack and one inch from the end of the toe. This is much safer and saves valuable time.



How the Jack is Applied.

PIER BURNS IN NEW YORK—A fire in the New York Central terminal at Sixty-third street, New York City, on August 12, destroyed a pier and 80 loaded freight cars, with an estimated loss of $1,000,000.

Maintaining Track to Line and Surface*

By Jack Wilson,
Section Foreman, Kansas City Southern, Ruliff, Tex.

WHEN SURFACING track, a level board should always be used, even if the particular job undertaken consists of simply raising one side of the track. No man's eye can be developed sufficiently to gage the transverse levels of a piece of track accurately, with the consequence that unless the level board is used irregular surface will result. This is more particularly true on curves when the outer rail is maintained at a greater elevation than the inner rail. While it is difficult to tell by the eye when the rails are level on tangent, it is increasingly difficult to gage properly the amount of super-elevation necessary on a curve to conform with the amount which is standard to that curve.

When surfacing out of face is undertaken, it is desirable to use a spot board. This will apply where the raise is from 2½ in. to 4 in. As is the case with the level board, the unaided eye is never as good as mechanical devices for sighting lines and again, unless the spot board is used and properly used, irregular surface will probably result.

In making light raises from 1 in. to 2½ in. tamping bars are preferable to other tamping tools when the ballast material is suited to them. With gravel ballast, the only way that a light raise of less than 2 in. can be made successfully is with tamping bars. In rock ballast, it is doubtful if as small a raise as 2 in. can be made even with tamping bars, while tamping bars are not desirable tools with chats. When a raise of as much as 2 in. or 3 in. is made on gravel or chats shovel tamping is the proper method.

When doing this character of work, the ends of the ties should be tamped first, leaving the centers untamped until a train has passed over them. By this method a good bearing on the ends of the ties will be obtained and there will be no trouble from center-bound track. My experience has been that whenever the center is tamped before the ends, center-bound track will result. This is especially true where the ballast is light. This is accentuated by the fact that the churning of trains causes the ballast to roll off the shoulder, with the consequence that it weakens the support under the ends of the ties. Where track is center-bound good line cannot be held.

Tie renewals are closely related to line and surface. In making tie renewals, ties should never be dug in unless there is sufficient ballast to prevent disturbance of the subgrade or foundation. If the ballast is light, the best result will be obtained by making a light raise when renewing ties. This will obviate the necessity of disturbing the roadbed. If ties are dug in where the ballast is light, it is impossible to keep from damaging the hard surface of the roadbed. This causes water to be retained and may result in a squeeze. This is frequently the cause of both poor line and surface.

Foremen should make a very careful inspection of ties to be removed and make sure they will not last six or eight months longer. A foreman can easily earn his wages be being on the job and giving the matter of tie renewals close attention. In making tie renewals, the large sound ties should be used at joints and all necessary precaution taken to see that the joint ties are given a good foundation.

*From a paper presented before the Kansas City Southern Maintenance of Way Association at Shreveport, La.

The Roadmasters' Association

Plans for the fortieth annual convention, which will be held at the Hotel Statler, Cleveland, on September 19-21, are being completed rapidly. All of the reports of the committees are finished ready for presentation at the convention and the special papers which will be presented are nearing completion.

Special features will be introduced at the evening session on Tuesday which will be devoted largely to a review of the forty years work of this association, which is the pioneer in the maintenance of way field. Special features will also be introduced at the annual dinner of the Roadmasters and the Track Supply Associations on Wednesday evening.

Plans for the exhibit of the Track Supply Association are progressing equally satisfatorily, over 50 firms having now made reservations for space including the following companies which have completed arrangements to exhibit since the last issue and whose names did not appear therein:

Aeroil Burner Co., Inc.	Union Hill, N. J.
American Chain Co.	New York
American Steel & Wire Co.	Chicago
Bethlehem Steel Co.	Bethlehem, Pa.
Craft Company, Inc.	New York
Chipman Chemical Engineering Co.	New York
Dougherty Safety Guard Rail Lock	Chattanooga, Tenn.
Headley Good Roads Company	Philadelphia, Pa.
National Malleable Castings Co.	Cleveland, Ohio
Oxweld Railroad Service Co.	New York
Railway Review	Chicago
Templeton Kenley & Co.	Chicago

The following companies have also taken membership in the Association without exhibits:

Ajax Forge Company	Chicago
Cleveland Frog & Crossing Co.	Cleveland, Ohio
Dilworth, Porter & Company, Ltd.	Pittsburgh, Pa.
Dressel Railway Lamp & Signal Company	New York
Elliot Frog & Switch Company	East St. Louis, Mo.
Morden Frog & Crossing Works	Chicago
Pettibone Mulliken Company	Chicago
The Q. & C. Company	New York
St. Louis Frog & Switch Co.	St. Louis, Mo.

Bridge and Building Association

Four of the eight committee reports are now completed and in the hands of the secretary for publication, while assurances have been received that the remaining four will be completed within a few days. Negotiations are also in the process of completion for the presentation of several papers which will be of special interest to B. & M. men at this time.

Wood Preservers' Association

The executive committee has filled the vacancy in the position of president occasioned by the death of F. J. Angier, superintendent of timber preservation, B. & O., Baltimore, Md., by the promotion of W. H. Grady, General American Creosoting Co., Louisville, Ky., and now first vice-president of the Association.

H. S. Sackett, assistant purchasing agent, C. M. & St. P., Chicago, and second vice president of the association

was moved up to first vice president, replacing Mr. Grady. E. J. Stocking, vice president Central Creosoting Co., Chicago, a member of the executive committee, was chosen second vice president. A. L. Kammerer, consulting timber engineer, St. Louis, was appointed a member of the executive committee, to fill the vacancy created by the promotion of Mr. Stocking.

The board of directors of the Service Bureau met in Chicago on August 15, with every member present. The work now under way was reviewed and plans for its extension discussed at length.

It is planned that a meeting of the executive committee of the association will be held in Chicago in October. The annual proceedings containing the report of the convention held in Chicago last January are now completed and are being mailed to the members.

Metropolitan Track Supervisors' Club

The Metropolitan Track Supervisors Club met at the Hotel Martinique, New York, on August 12, with approximately 40 members present. J. V. Neubert, engineer maintenance of way of the New York Central presented a discussion on labor costs as compared with material costs, following which S. A. Hart, supervisor, Pennsylvania System, Mt. Holly, N. J., presented a paper on the construction of road crossings. Both of these papers are abstracted elsewhere in this issue.

Maintenance of Way Club of Chicago

The first meeting for the second year of the Maintenance of Way Club of Chicago will be held at the Auditorium Hotel, Chicago, on September 6, at 7:30 p. m. standard time, following a get-together dinner in the dining room of the hotel at 6:00 p. m. F. W. Hillman, division engineer, Chicago & North Western, will present a paper on "Track Walking." The business of the meeting will also include the annual election of officers.

Section Men as Traffic Solicitors

THE POSSIBILITY of maintenance of way employees aiding in soliciting traffic for their roads has been given little thought, yet it is frequently the case that, because of their contact with shippers, they can be instrumental in routing much business over their roads. Emphasis was placed on this fact at a recent meeting of the St. Louis District committee of the maintenance of way employees of the Missouri, Kansas & Texas at Sedalia, Mo., at which more than 100 were present.

In opening the meeting the chairman called attention to the fact that "there are many farmers on our line who are feeding stock and who ship in many cars of grain. If you know them remind them of the fact that you are personally interested in its coming in over the M. K. & T. If these shipments are coming from off-line points see that we get the longest possible haul. Some of you have neighbors who patronize the mail order houses. Talk to them and see if they are having these shipments routed over our line."

A representative of the maintenance of way employees' organization stated that he "met a prominent shipper on a train from Kansas City a short time ago and in the course of the conversation asked him to route his shipments over the Katy. The shipper asked me what my business was and when I told him he said 'You're a funny man to be soliciting business for the company.' I told him that I thought a good union man should cooperate with the company. This man, who is a dealer in apples and potatoes, promised to give the road as much of his business as possible."

The Material Market

THE SELLER'S market is with us once more. It is true that we are not confronted with the wild cat scramble for materials which prevailed in the balmy days of 1920, but the present situation is serious because of the curtailment of production. Thus the operations of the United States Steel Corporation, which until recently were on the basis of 65 to 70 per cent of capacity, were cut down by the middle of August to about 60 per cent and it is understood that the independent steel manufacturers are working to not more than 50 per cent of maximum output.

The lumber industry has suffered disproportionately from the rail strike for reason of the fact that it is in the west and the south, particularly the latter, that the railroads have suffered most severely from the strike, and therefore the movement of lumber and the supply of cars are slower than in the less favored portions of the country. The shortage of coal which is such a vital item in the production of Portland cement is beginning to have its effect also in that quarter, but while this probably will have little effect on railroad construction it is beginning to exert an influence on the concrete highway building programs.

It goes without saying that such conditions are reflected immediately in the prices, as will be noted in all of the tables given below. As is usual in the case of a rising market in iron and steel commodities, the base prices of the United States Steel Corporation remain stationary while those of independent manufacturers advance. However, true to previous experience the lower prices have become purely nominal since it is impossible to place orders on them for anything but very remote delivery. No change has taken place in the price of standard steel rails, which remain $40 per gross ton f.o.b. mill.

Prices Per 100 Pounds

	July 20		August 20	
	Pittsburgh	Chicago	Pittsburgh	Chicago
Track spikes	$2 25	$2.59 to $2.69	$2.35 to $2.50	$2.60 to $2.75
Track bolts	3.00 to $3.25	3.59 to 3.69	3.25 to 3.50	3.60 to 3.75
Angle bars	2.40	2.40	2.40	2.40
Tie plates, steel	2.00 to 2.25	1 85	2.00 to 2.25	2.00
Tie plates, iron		1.85		2.00
Plain wire	2.25	2.59	2.25 to 2.35	2.59 to 2.69
Wire nails	2.40 to 2.50	2.74 to 2.84	2.40 to 2.60	2.74 to 2.94
Barbed wire, gal.	3.05 to 3.15	3.39 to 3.49	3.05 to 3.15	3.39 to 3.49
C. I. pipe, 6 in. or larger, per ton		46.70		47.20
Plates	1.60 to 1.80	1.75 to 1.85	1.80 to 2.00	1.90 to 2.00
Shapes	1.60 to 1.80	1 75 to 1.85	1.80 to 2.00	1.90 to 2.00
Bars	1.60 to 1.80	1.75 to 1.85	1.80 to 2.00	2.00

There has been little movement of scrap and little new scrap is being offered, particularly by the railroads. Nevertheless, the prices show a definite advance over those of last month.

	Prices Per Gross Ton at Chicago	
	July	August
Relaying rails	$22.50 to $27.50	$22.50 to $27.50
Rerolling rails	16.00 to 16.50	19.00 to 19.50
Rails less than 3 ft. long	17.50 to 18.00	18.50 to 19.00
Frogs and switches cut apart	15.00 to 15.50	15.75 to 16.25
	Per Net Ton	
No. 1 railroad wrought	13 50 to 14.00	14.50 to 15.00
Steel angle bars	14.75 to 15.25	15.00 to 15.50

The prices of lumber have advanced during the past month, particularly in the case of southern pine, as noted in the table below.

Southern Pine Mill Prices

	July	August
Flooring, 1x4, B and B. flat	$46.60	$45.55
Boards, 1x8, 14 and 16, No. 1	31.65	38.90
Dimension, 2 x 4, 16, No. 1	26.30	27.10
Dimension, 2x10, 16, No. 1, common	25.45	27.30
Timbers, 4x4 to 8x8, No. 1	24.40	24 85
Timbers, 3x12 to 12x12, No. 1	....	31.45
Douglas Fir Mill Prices		
Flooring, 1x4, No. 2, clear, flat	36.00	37.00
Boards, 1x6, 6 to 20, No. 1, common	12.50	14.00
Dimension, 2x4, 16, No. 1, common	16.50	18.50
Dimension, 2x10, 16, No. 1, common	16.50	17.50
Timbers, 6x6 to 8x8, No. 1, common	17.00	17.00
Timbers, 10x10 to 12x12, rough	18.00	17.00

The News of the Month

Statistics prepared by the Interstate Commerce Commission show that the number of employees on the rolls of Class I railroads, in May, 1922, was 1,628,228, an increase of 50,095 or 3.2 per cent as compared with April.

Glenn E. Plumb, counsel for the principal railroad labor organizations and the author of the Plumb plan for government ownership of the railroads and their operation for the benefit of the employees, died at Washington on August 1 after an illness of several months.

The latest business venture of a labor union is that of the Brotherhood of Railway and Steamship Clerks, Freight Handlers, Express and Station Employees, which has purchased a prominent tract of land in Cincinnati, Ohio, for $200,000 and is preparing plans to construct a seven-story building, to cost about $350,000.

L. A. Downs, vice-president and general manager of the Central of Georgia, who was president of the American Railway Engineering Association last year, has been elected an honorary corresponding member of the National College of Italian Railway Engineers. Mr. Downs was a delegate to the International Railway Congress at Rome last May, at which time this honor was conferred on him.

The railroad built by the Spruce Production division of the Aviation Service in the state of Washington during the war, was recently sold by the War Department to interests on the Pacific Coast, who will operate the road as a common carrier. The property includes 36 miles of standard gage railroad extending from Disque, a point on the Chicago, Milwaukee & St. Paul, to Lake Pleasant. The sale price was $1,000,000.

A street car strike in Chicago for the first six days in August placed an enormous burden on the railroads which handle suburban traffic in that city, nearly 200,000 passengers being carried by steam roads each day in excess of the number normally handled in suburban trains. Thus the Illinois Central, which averages about 73,500 suburban passengers daily, carried 157,517 passengers on August 5.

The latest innovation in the Grand Central Terminal, New York, is a "message exchange," which consists of a large booth, where a clerk will attend to all sorts of passengers' wants, especially requests to send (or receive) a telephone message when the passenger has not time to attend to it himself. The uniform fee is ten cents. Written messages, telegrams, etc., are forwarded, or received and held to await the addressee. Another innovation is Polk's Information Bureau, adjacent to the regular information bureau, on the upper level, for hunting up addresses.

To relieve the serious crisis arising as a consequence of the coal strike, efforts initiated by Herbert Hoover, secretary of commerce, have been fruitful in the development of an organization to distribute the available coal supply. Henry P. Spencer, formerly director of the division of purchases of the Railroad Administration, has been appointed coal distributor, and a group of committees have been appointed to act with him. These are headed by the President's fuel distribution committee, consisting of Secretary of Commerce Hoover, Attorney-General Dougherty, Secretary of the Interior Fall, Commissioner Aitchison of the Interstate Commerce Commission and Mr. Spencer. This organization is designed primarily for the distribution and allocation, to the various states, of the available coal produced, responsibility being placed on the individual states to affect an equitable intrastate distribution of the coal allocated to them. Among other measures taken have been the issuance of service orders designed to expedite the movement of coal by the shortest possible route and rules of priority for the distribution of coal. These orders were issued by the Interstate Commerce Commission declaring the existence of a national emergency as evidenced by the fact that coal production has fallen to approximately 3,600,000 per week, while railroad requirements alone are approximately 2,500,000 per week, and some roads had only a few weeks' supply left.

An analysis has recently been made of the wage and rate statistics of the Interstate Commerce Commission to determine the relation between the wages paid to certain employees and the freight required to produce the revenue necessary to pay these wages. Some of the results of this analysis are contained in the table, the last column of which shows the tonnage in terms of the number of miles which one ton of freight would have to be hauled to earn the amount of wages in question.

	Average Annual Compensation	Average Freight Rate Ton-mile (Cents)	Ton Miles Necessary
Section men—			
1915 (fiscal)	$ 454	0.722	62,881
1920 (calendar)	1,141	1.052	108,460
July, 1921	888	1.254	70,813
July, 1922	770	1.116	68,996
Section foremen—			
1915 (fiscal)	772	0.772	106,925
1920 (calendar)	1,681	1,052	159,791
July, 1921	1,404	1.254	111,962
July, 1922	1,326	1.116	118,817
Machinists—			
1915 (fiscal)	1,030	0.722	142,659
1920 (calendar)	2,179	1.052	207,139
July, 1921	1,908	1.254	152,153
July, 1922	1,734	1.116	155,466
Clerks—			
1915 (fiscal)	847	0.722	117,313
1920 (calendar)	1,586	1.052	150,760
July, 1921	1,462	1.254	116,587
July, 1922	1,391	1.116	124,646

Personal Mention

Engineering

E. B. Sloan has been appointed chief engineer of the Southern Pacific of Mexico, with headquarters at Empalme, Sonna, Mexico, succeeding **C. K. Bowman,** resigned.

J. B. Pope, chairman of the Valuation committee of the Southern Pacific, Pacific System, with headquarters at San Francisco, Cal., has been appointed consulting valuation engineer, with office at the same place. G. E. B. Welles has been appointed engineer of land valuation. J. H. Baker has been appointed assistant engineer of valuation.

J. R. Sexton, regional engineer, Erie, with headquarters at Huntington, Ind., has been transferred to the Transportation building, Chicago. **H. D. Row,** assistant engineer and formerly division engineer on the Cincinnati division with headquarters at Marion, O., has been promoted to division engineer of the Marion and Ohio divisions with headquarters at Huntington, Ind. **F. J. Haagen,** assistant division engineer at Huntington, has been promoted to division engineer of the Cincinnati division with headquarters at Marion.

E. M. Hastings, principal assistant engineer of the Richmond, Fredericksburg & Potomac, has been promoted to chief engineer, with headquarters at Richmond, Va. **C. E. Dare** has been appointed engineer maintenance of way, with headquarters at Alexandria, Va., effective August 15.

Mr. Hastings entered railway service with the Baltimore & Ohio as a rodman and chainman in 1900 working during the summer of that year and the following one, and during the entire year of 1902. In 1903 he left the Baltimore & Ohio to enter the employ of the Richmond, Fredericksburg & Potomac as instrumentman, remaining in this position until 1906, when he was promoted to resident engineer. In 1920 he was promoted to principal assistant engineer in which capacity he continued until his recent promotion.

Track

J. S. Healy has been appointed roadmaster on the Southern Minnesota division of the Chicago, Milwaukee & St. Paul, with headquarters at Madison, S. D., effective August 1, succeeding **W. H. Crabbs,** deceased.

W. S. Van Dorn, who was appointed supervisor of track on the Erie with headquarters at Crown Point, Ind., having territory from North Judson, Ind., to Hammond, effective July 1, has recently had his territory extended to include the Chicago Terminal division.

Noah Bridges, roadmaster on the Atchison, Topeka & Santa Fe, with headquarters at Florence, Kan., has been appointed acting roadmaster of the Strong City, Minneapolis & Salina district of the Middle division, with headquarters at Abilene, to succeed **A. W. Ross.**

M. H. Kilgore, whose appointment as roadmaster on the Western Pacific, with headquarters at Wendover, Utah, was noted in the June issue, was born at Careston, Iowa, on November 6, 1878. For 10 years Mr. Kilgore was in charge of extra gangs and section gangs on the Union Pacific and the Southern Pacific and from 1909 to 1920 he served as roadmaster on the Western Pacific. In 1920 he left the service of the Western Pacific to become roadmaster on the Bamberger Electric Railway, with headquarters at Salt Lake City, which position he held at the time of his recent appointment.

Bridge and Building

W. C. Harmon, bridge inspector on the Southern Pacific, has been promoted to supervisor of bridges and buildings on the San Joaquin division with headquarters at Bakersfield, Cal., succeeding **Alex Fraser,** whose death on July 20 is noted in another column.

Purchasing and Stores

W. P. Dittoe, purchasing agent of the New York, Chicago & St. Louis, has been appointed general purchasing agent of that road and the Lake Erie & Western.

C. M. Yohe, assistant purchasing agent of the Pittsburgh & Lake Erie, with headquarters at Pittsburgh, Pa., has been promoted to purchasing agent, with the same headquarters.

Obituary

Alex Fraser, supervisor of bridges and buildings on the Southern Pacific, with headquarters at Bakersfield, Cal., died in that city on July 19.

C. F. Warcup, foreman of water service on the Grand Trunk, with headquarters at London, Ont., died on August 5 after an extended illness.

A. E. Killam, for many years general inspector of bridges and buildings of the Intercolonial Railway, now a part of the Canadian Government Railways, with headquarters at Moncton, N. B., died at his home in that city on August 20 at the age of 88. Mr. Killam had been active in the American Railway Bridge and Building Association for many years, and was president of that association in 1913. His early life was spent in New Brunswick on a farm, but in 1864 he undertook some bridge contracting, which he continued from time to time until he became recognized as a successful constructor of highway bridges. In 1876 he was induced to undertake railway construction as a contractor, continuing in this work for several years, in the course of which in 1884 he served as managing director of the Moncton and Buctouchte Railway up to the time it was sold. For some years prior to this date he took an interest in political affairs in Canada and from June, 1874 until 1897 he served in public office in various capacities. In the latter year he was appointed bridge and building inspector of the Intercolonial Railway and the Prince Edward Island, a position he held until May 15, 1913, when he retired from active service.

Edwin Chamberlain, assistant engineer on the Philadelphia & Reading and for many years connected with that property, died on August 15. Mr. Chamberlain was born in Philadelphia on September 30, 1854. After preparatory work at the Lackawanna school, Scranton, Pa., he entered the scientific department of Lafayette college, Easton, Pa., in 1880, but left in the fall of that year to take a position as clerk to the chief engineer of the Philadelphia & Reading canal, and in the following year was made inspector of water power in the same office. In January, 1882, he was transferred to the Philadelphia & Reading railroad and was employed on the preliminary survey for a line between Shamokin and Danville, later having charge of the construction of this line. In March, 1883, he was made division roadmaster at Reading, and afterwards was promoted to division engineer, serving in that capacity until January, 1887, when he was assigned to surveys for the extension of the Philadelphia & Newtown, and other construction projects. In 1888, he was employed for a time on construction work for the Reading Paper Mills, and for several years thereafter he was engaged in various railway extension projects. From 1894 to 1897 he was city engineer of Reading, Pa., and for two years following this he was engaged in water supply work for the city of Binghamton, N. Y. In December, 1899, he returned to the Philadelphia & Reading in charge of location and construction of the Reading Belt railroad and from 1902 to 1904 he had charge of the construction of the Norristown Connecting railroad, including a bridge over the Schuylkill river. Other miscellaneous construction work engaged his time until 1906, when he was placed in charge of the elimination of grade crossings in Philadelphia, work which he directed until his death.

Edwin Chamberlain

Construction News

The Atchison, Topeka & Santa Fe contemplates the extension of its line between El Segundo, Cal., and Wilmington Harbor.

The company, which was noted in the July issue as having closed bids for the construction of a 38-mile cut-off between Ellinor, Kan., and Eldorado, as well as a belt line around the city of Eldorado, which, with other trackage, will total 5½ miles additional, has awarded a contract for this work to the Bates & Rogers Construction Company, Chicago. The project will shorten the present route by 13.65 miles and will cost about $3,046,000. This company has applied to the Interstate Commerce Commission for authority for the construction of two branches, one from a point 1.7 miles south of Burbank, Okla., 6.24 miles in a northeasterly direction, and one from Denoya, Okla., east 2.97 miles.

This road has awarded a contract for the construction of a new division office building at Newton, Kan., to Swanson Bros., Topeka, Kan. The building will be 70 ft. by 160 ft. and will be three stories high, costing approximately $200,000.

This company has awarded a contract for the construction of a new boiler shop at Albuquerque, N. M., to C. A. Fellows & Co., Los Angeles, Cal.

The Baltimore & Ohio has awarded a contract to the Seaboard Construction Company, Philadelphia, Pa., for the elimination of a grade crossing with the Lincoln highway at Lumbrook, Del. The railroad tracks are to be carried over the highway on a double track, through plate girder span. The steel for the work was fabricated by the Fort Pitt Bridge Works.

This road has placed a contract with the American Bridge Company for the erection of two plate girder spans, 80 and 112 ft. in length, on its Parkersburg branch at Smithburg and West Union, W. Va.

The Canadian National will replace a 2,400-ft. trestle over the Bird Tail Creek valley, 190 miles west of Winnipeg, Man., by an embankment and a 79-ft, deck plate girder span on concrete abutments 56 ft. high.

Canadian Pacific has prepared plans for new stations at Napinka, Man., and Chaton, Alta. A new detention shed will be erected at Coutts, Alta., and the roundhouses at Medicine Hat, Alta., and Calgary will be enlarged. This company is also planning to install two 90-ft. turn tables at Brandon, Man., and North Bend, B. C., and a coaling plant will be constructed at Secretan, Sask. A transfer barge will be constructed on Kootenay Lake, B. C., and the temporary wharves at Nelson, B. C., will be made permanent.

The Carbon County Railroad has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a new line from a junction with the Denver & Rio Grande Western for a distance of 4½ miles in Carbon County, Utah.

The Chicago, Burlington & Quincy will construct a low-grade line from the Illinois river bottoms at Frederick, Ill., to Vermont, a distance of 15½ miles, to facilitate the handling of heavy northbound coal traffic.

This road, which was reported in the August issue as calling for bids for the construction of a two-story brick addition to its freight house at Burlington, Iowa, has awarded the contract for this work to the T. S. Leake Construction Company, Chicago.

The Illinois Central has awarded a contract to the Fred R. Jones Company, of Chicago, for the laying of approximately three miles of spur tracks in Louisville, Ky., to connect with the Standard Oil Company properties in that city, the work to cost approximately $100,000. This same company has awarded a contract to the Merrill Road Improvement Company, Vicksburg, Miss., for raising the grade and paving freight house approaches at Vicksburg, Miss., at an estimated cost of $25,000.

This road has awarded a contract to the Ellington-Miller Company, Chicago, for the masonry work incident to the reconstruction of the Island creek bridge in the double tracking of the line between Paducah, Ky., and Clark, a distance of 3½ miles. The work will involve an expense of approximately $25,000. A contract has also been awarded the Fred R. Jones Company, Chicago, for the laying of the second track at an estimated cost of $125,000.

This company is also inquiring for bids for the construction of a pumping station and about one mile of 6-inch pipe line at Matteson, Ill., to cost approximately $25,000, and also a 100,000-gal. water tank. The company is also inquiring for bids for alterations to its freight house at Indianapolis, Ind., including the construction of a new transfer platform and concrete paving, which work was noted as being contemplated in the *Maintenance Engineer* for August.

The Illinois Central is calling for bids for the construction of nine water treating plants to be located at Council Bluffs, Iowa, Logan, Dunlap, Denison, Rockwell City, Wall Lake and Fort Dodge on the Iowa division; and at Amboy, Ill., and LaSalle on the Wisconsin division, four of these to be of 10,000, three of 20,000 and two of 30,000 gal. per hour capacity. Bids are also asked for the rebuilding of existing water treating plants at Manchester, Iowa, Galena, Ill., and Scale's Mound on the Minnesota division, to increase their capacity from 10,000 gal. to 20,000 gal. per hour and to install filters.

This company has awarded a contract for the construction of water treating plants at Galena, Ill., Amboy, Ia., Fort Dodge and Council Bluffs to Joseph E. Nelson & Sons, Chicago, and for plants at Wall Lake, Ia., Logan, Rockwell City and Denison to the Railroad Water & Coal Handling Company, Chicago.

The Kansas, Oklahoma & Gulf has been issued a certificate by the Interstate Commerce Commission authorizing the construction of an extension from Baxter Springs to Military Junction, Kan., 6½ miles.

The Los Angeles & Salt Lake has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a branch from Lund to Cedar City, Utah, 32 miles.

The Magma Arizona has awarded a contract to Twohy Brothers, Phoenix, Ariz., for improvements on its line to include extensive grade revision work and the re-laying of 35 miles of track.

The Minneapolis, St. Paul & Sault Ste. Marie closed bids August 14 for the construction of a passenger station at Menasha, Wis., and a 21-stall roundhouse at Gladstone, Mich.

The Missouri Kansas & Texas has awarded a contract to H. D. McCoy, Cleburne, Tex., for the construction of a freight house at Wichita Falls, Tex.

This road will accept bids until Sept. 1, for the construction of a brick and steel locomotive shop, 222 ft. by 475 ft., at Waco, Tex.

This company has awarded a contract to the Graver Corporation, Chicago, for the construction of a Graver type K, ground operated water softening plant with a capacity of 15,000 gal. per hour and a storage capacity of 100,000 gal. of treated water at Glen Parks yard, Kansas City, Kan.; a plant of the same type with a capacity of 10,000 gal. per hour at Melagony, Okla.; one of 5,000 gal. per hour capacity at Eufaula, Okla.; also four standpipes 14 ft. in diameter by 32 ft. high and one standpipe 18 ft. in diameter by 32 ft. high, for use in Texas.

The Missouri Pacific has awarded a contract to the T. S. Leake Construction Company, Chicago, for the construction of a car repair shed at Sedalia, Mo., to cost approximately $25,000.

The Nashville & Atlantic has applied to the Interstate Commerce Commission for a certificate authorizing the construction of an extension of about 12 miles from Campaign, Tenn.

The Oregon-Washington Railroad & Navigation in conjunction with the Oregon State Highway Commission, will construct an undercrossing on the Shaniko branch at a point about two and a half miles south of Moro, Ore.

The Pennsylvania called for bids during the month for the construction of an overhead bridge at Leaman Place, Pa. The approximate quantities are as follows: 1,200 cu. yd. foundation excavation; 2,200 cu. yd. foundation and abutment masonry; 250 cu. yd. concrete bridge floor including reinforcement; and 375 sq. yd. paving on bridge.

The Philadelphia & Reading has awarded a contract to F. W. Van Loon, Philadelphia, Pa., for the construction of a building at Eighth and Master streets, Philadelphia, which will be leased to the American Railway Express Company for its use. The plans call for a one-story structure of steel frame covered with corrugated asbestos metal. The building will be 337 ft., 6 in. long and 86 ft., 10 in. wide, supported on a concrete foundation.

This company has started the reconstruction of bridges Nos. 7 and 8 on the New York division, near Bethayres, Pa. Both bridges will be constructed of steel encased in concrete and resting on concrete piers. Their lengths will be 55 ft. and 200 ft. respectively.

The Richmond, Fredericksburg & Potomac has awarded a contract to the Roberts & Schaefer Co., Chicago, for the construction of two 1,000-ton coaling stations to be erected at Acca yard, Richmond, Va., and Potomac yard, Alexandria.

The Tennessee, Alabama & Georgia has applied to the Interstate Commerce Commission for a certificate authorizing the construction of an extension from Gadsden, Ala., to Odenville on the Seaboard Air Line and Margaret on the Central of Georgia, a total of 34 miles.

The Utah Central has applied to the Interstate Commerce Commission for a certificate authorizing the construction of a line through or near Huntington, Desert Lake and Cleveland, Utah, to Wellington on the Denver & Rio Grande Western, with a branch connecting with the Utah Railroad, a total of about 50 miles.

The Union Pacific is calling for bids for the construction of two standard brick oil houses 28 ft. by 115 ft. at Grand Island, Neb., and Green River, Wyo.

This road has awarded a contract for the construction of a brick freight house at Denver, Colo., to P. J. Sullivan, Denver, Colo., at an estimated cost of $240,000.

This company has awarded a contract to the Graver Corporation, Chicago, for a type K Graver, ground operated water softener with a capacity of 30,000 gal. per hour, to be erected at Granger, Wyo., and for the reconstruction of five treating plants at other points to adapt them to the Graver type K design. This company will also construct an oil house 70 ft. by 110 ft. at Omaha, Neb.

The Wabash which was reported in the April issue as having been ordered by the Missouri Public Service Commission to construct a new freight station and to remodel its present passenger station at Kirksville, Mo., has awarded a contract for this work to the T. S. Leake Construction Company, Chicago.

Equipment and Supplies

The Alaskan Engineering Commission, Seattle, Wash., closed bids on August 16 for the furnishing of guard rails, switch stands, switches and frogs.

The Boston & Maine has ordered 500 tons of steel for a bridge at Biddeford, Maine, from the Boston Bridge Works.

The Chesapeake & Ohio is inquiring for 300 tons of bridge steel.

The Chicago & North Western has placed an order with the American Bridge Company for three steel deck girder spans (215 tons) to be used over the Milwaukee River near Lindwerm, Wis.

The Chicago Union Station Company has placed an order with the Webster Manufacturing Company for the coal and ash handling equipment to be installed in the boiler plant of the new station.

This company is also inquiring for 23 spans of structural steel to be used for the viaduct over its tracks at Roosevelt road.

The Kansas City Southern has placed an order with the McClintic-Marshall Construction Company for 1,900 tons of steel to be used in the construction of a bridge over the Arkansas River at Redlands, Okla.

The Missouri, Kansas & Texas has placed an order with the Mississippi Valley Structural Steel Company for 350 tons of steel to be used in the construction of its new shops at Denison, Tex.

The Missouri Pacific is inquiring for 3,000 kegs of track spikes.

The Norfolk & Western is receiving bids for fabricated steel to be used in repairing and enlarging its coal piers and for track work at Lamberts Point, Va.

The Southern Pacific Lines have placed an order with the Tennessee Coal, Iron & Railroad Company for 45,240 gross tons of first quality open hearth steel rails for delivery in the first half of 1923 and have also placed an order with the Lorain Steel Company for 670 gross tons of special girder rail, for delivery early in 1923.

The Southern Pacific Lines have also divided an order for 2,500 kegs of spikes between the Gary mill of the U. S. Steel Corporation and the Colorado Fuel & Iron Company.

The Union Pacific has placed an order with the Industrial Works, Bay City, Mich., for a 15-ton locomotive crane with 45 ft. boom.

The Wabash is inquiring for 240,000 tie plates and 200 kegs of track bolts.

Trade Publications

Trade Standards.—A bulletin has recently been published by the Hydraulic Society containing the definitions and terms in the pump industry which are recommended for use as the standards governing all transactions between buyers and sellers concerning performances and the buying of equipment for pumps.

Reinforced Concrete Signal Cellars.—A 12-page booklet recently issued by the Massey Concrete Products Company, Chicago, giving a detailed explanation together with photographs and drawings to show the several advantages reinforced concrete signal cellar construction. Ten photographs are used to illustrate the story of the distribution and setting of signal cellars, from the flat car to the finished signal in service on an actual test. When requesting copies of this booklet ask for Catalog Supplement No. 11.

Schoop Metal Spraying Process.—The Metals Coating Company of America, Philadelphia, Pa., has recently issued a large size, 18 page, illustrated bulletin descriptive of the metal spraying process developed by that company. The bulletin discusses fully the details of the process and the equipment, showing both by text and by numerous illustrations the various forms and classes of structures, such as bridges, pipe, car frames, towers, etc., which can be treated by this process of spraying on a thin coating of such metals as zinc, lead, aluminum, tin, copper, etc., for protection against corrosion and other destructive agents.

That accidents at crossings of railroads and highways are becoming an increased menace to the railroads, is demonstrated by a collision occurring on the Minneapolis, St. Paul & Sault Ste. Marie, near Annandale, Minn., on August 12, when train No. 107 of that road collided with a motor truck. While this did not result in the derailment of the locomotive the truck was thrown against a switch stand, turning three coaches of the train into a side track and against a standing freight train. Ten persons were killed and a large number were injured. The dead included the two occupants of the motor truck.

A. L. Johnson, president of the Corrugated Bar Company of Buffalo, and originator of the corrugated, or what was long known as the Johnson bar, died on July 21. Mr. Johnson was a younger brother of the late Dean J. B. Johnson of the University of Wisconsin, and was educated under the latter's direction at Washington University, St. Louis, Mo. After a number of years of engineering experience of various kinds, he organized the St. Louis Expanded Metal Fireproofing Company and entered actively into the investigation and study of reinforced concrete in this country, and was prominently identified with the development of reinforced concrete practice in this country, being a member of the first "Joint Committee" on reinforced concrete. He was actively associated with the Corrugated Bar Company from the time of its organization and served as its president for a number of years.

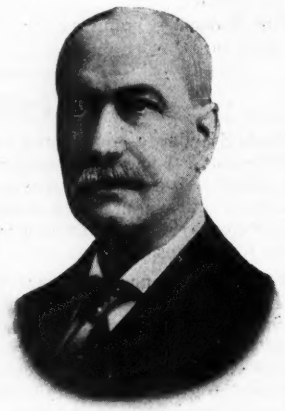
Supply Trade News

Personal

T. H. Lange has been appointed traffic manager of the **Pawling & Harnischfeger Company,** Milwaukee, Wis.

W. E. Farnan has been appointed director of the special committee on railroad lumber requirements of the Southern Pine Association, with headquarters at New Orleans, La.

Edward S. Shepherd, president of Crerar Adams & Co., Chicago, died at his home in that city on August 21. Mr. Shepherd was born in Orleans, N. Y., on May 28, 1845, and entered railway service in the purchasing department of the Illinois Central, with headquarters at Chicago, in 1865. He served this company four years and in 1869 he gave up railway service to enter the employment of Crerar Adams & Co. as a salesman, and had been connected with that concern continuously until his death. He served in that capacity until 1877. During that year he was made a junior partner in the company and in 1890 was elected president, which position he had occupied for the past twenty-three years.



E. S. Shepherd

Edward L. Lefler has been appointed manager of the recently organized railroad sales department of the **General Fireproofing Company,** Youngstown, Ohio, with headquarters at 325 West Madison street, Chicago, Ill. Mr. Lefler served as secretary to the vice-president of the New York Central at Boston, Mass., from April, 1907, to August, 1917. For the past five years he has devoted his entire time to selling office equipment and systems to railroads in Chicago.

L. M. Ritchie has been appointed sales engineer in the railroad sales department of the National Carbon Company, Inc., with headquarters at Cleveland, effective September 10. Mr. Ritchie was born at Bernice, Pa., on March 20, 1892. After attending Clarion State Normal school in 1910 and 1911 he taught school for a year, after which he enrolled at Allegheny College, Meadville, Pa., in 1912, graduating in 1916. After doing graduate work in chemistry, he was made a member of the Electro Chemistry section of the Bureau of Standards, where he spent a year in research on zinc, lead and black nickel plating, and from that time until his recent appointment to a position with the National Carbon Company he has devoted his time exclusively to work in chemical and physical testing laboratories. In 1919 he was made assistant chief of the Electro Chemistry section, being placed in charge of the chemistry work. In this position he was responsible for a large amount of research in connection with battery testing, chemical analysis, writing of specifications, etc.

L. M. Ritchie

Louis O. Henggi, inventor of the Henggi rail anchor, died at his home at Oakmont, Pa., on July 22. Mr. Henggi was connected with the P. & M. Co. for a number of years.

General

The King Pneumatic Tool Company has moved into a new factory at 1735 Armitage avenue, Chicago, with more than double the capacity of the former plant.

The Compaignie des Appareils, P. et M., has been organized with headquarters at No. 7, Rue Scribe, Paris, as the French agency for the selling of the rail anti-creepers of the **P. & M. Company,** with which company it is associated.

The Pressed Steel Car Company, Pittsburgh, Pa., has recently incorporated in Illinois the **Pressed Steel Car Company of Illinois,** capitalized at $5,000, and the **Koppel Industrial Car & Equipment Company,** also capitalized at $5,000. The parent company is a New Jersey corporation and the Koppel concern, a subsidary of Pressed Steel Car, is incorporated in Pennsylvania.

The Air Reduction Sales Company, N. Y., has undertaken a plan for the expansion of its manufacturing facilities. Sites have been bought for an Airco acetylene plant at Birmingham, Ala.; an oxygen plant at Milwaukee, Wis.; and an acetylene plant and a calorene plant at Pittsburgh, Pa.; at the latter place the company recently completed an oxygen plant. The construction of the plant at Birmingham already has begun, and plans are well under way for putting up the plants at Milwaukee and Pittsburgh. In addition to these new plant installations, the company's facilities for producing oxygen from the air will be enlarged in Buffalo and Minneapolis. The estimated cost of the proposed improvements is over $500,000.

Attack on Pyrene Fire Extinguishers Disproved.—An accident in the New York subways on July 6 caused by a short circuit resulted in the burning of a considerable amount of paint, insulation and rubber in one of the cars, which filled the subway with smoke and fumes from which several people were overcome. In a report issued shortly after the accident, Mayor Hylan attributed these casualties to the Pyrene fire extinguishers which had been used to put out the fire, and it was recommended that they should not be used in subway cars, but that sand should be used for extinguishing electrical fires. Owing to the wide publicity which this report received the Transit Commission of the State of New York has made a detailed investigation of this accident, assisted by experts from the Federal Bureau of Mines and by Gibbs & Hill, consulting electrical engineers of New York.

At the time of the accident seven fire extinguishers in all were used to break the electric arc and to extinguish the resulting fire in the insulation. The evidence showed that although the smoke and fumes given off by the burning materials and the carbon tetrachloride were dense and thick most of the train crew remained within a few feet of the fire throughout its duration, without suffering any ill effects. The Commission concluded that the poisoning was due to smoke and fumes from the burning insulation, paint and other organic matter and not from the carbon tetrachloride in the fire extinguishers, the passengers affected by the smoke having shown no signs of poisoning other than that of smoke from ordinary fires. It classed the use of sand and powder as fire extinguishers as impracticable, as the electric equipment is either hung on a vertical wall, underneath the car floor, or from the ceiling. The report further states that carbon tetrachloride is the standard in general use, is approved by the National Boad of Underwriters, and is particularly adapted for fires produced by short circuits in electrical equipment, as it is a non-conductor and will extinguish arcs.

The Engineering Institute of Canada will hold a general meeting at the Fort Garry Hotel in Winnipeg, Man., on September 5-7. Railroad subjects to be discussed include the construction of the Moncton yard and engine facilities, and the automatic grain unloaders at Port Arthur.

Classified Advertisements

FOR SALE

Two Double Track Swing Bridges

The First Bridge, is a double track, through truss swing span, 180 ft. center to center of end bearings; 28 ft. 9 in. center to center of trusses; motor driven; weight approximately 500,000 pounds, including machinery; E-40 rating.

The Second Bridge, is a double track, through truss swing span, 203 ft. center to center of end bearings; 28 ft. center to center of trusses; motor driven; weight approximately 575,000 pounds; Cooper E-30 rating.

Delivery of the first bridge could be made in October, 1922, and the second bridge in January, 1923.

Detailed plans of these bridges will be supplied upon request, or can be seen at our offices at 1103 Real Estate Exchange Building, Detroit, Michigan.

BOARD OF COUNTY ROAD COMMISSIONERS.
EDWARD N. HINES, Chairman,
JOHN S. HAGGERTY, Commissioner,
WILLIAM F. BUTLER, Commissioner.

A classified advertising section will be incorporated in this publication whenever necessary.

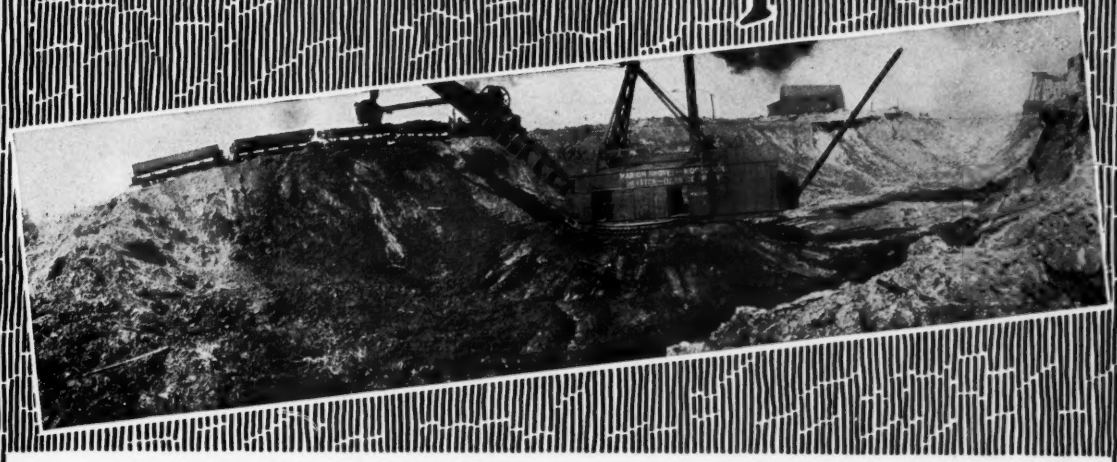
Classified advertisements $6.00 an inch, one inch deep by three inches wide, an insertion.

Employment advertisements five cents a word a month; minimum charge $1.00.

Remittance must accompany each order.

Address Railway Electrical Engineer, Classified Advertising Department, Woolworth Building, New York, N. Y.

Big digging equipment made practical



"K&J" All Steel Automatic Air Dump Cars are made in capacities of 12, 16, 20, 25, 30 and 33⅓ cu. yds. level capacities

TRADE MARK

K&J STANDARD OF SATISFACTION

REG. U.S. PAT. OFF.

"K & J" All Steel Automatic Air Dump Cars are covered by patents as follows:

872,057—Nov. 26th, 1907.
907,218—Dec. 22nd, 1908.
921,376—May 11th, 1909.
973,229—Oct. 18th, 1910.
1,029,247—June 11th, 1912.
1,034,418—Aug. 6th, 1912.
1,057,413—Apr. 1st, 1913.
1,178,208—Apr. 4th, 1916.
1,236,368—Aug. 7th, 1917.
1,281,508—Oct. 15th, 1918.

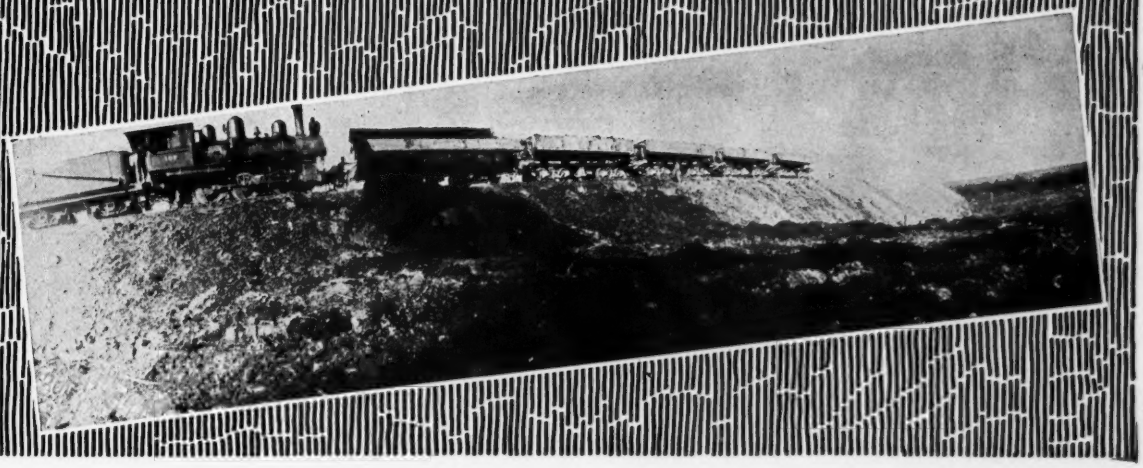
Other patents pending.

Big digging equipment can be economically used only when sturdy, quick operating car equipment is available for servicing it. "K&J" All Steel Automatic Air Dump Cars meet all the requirements of the largest digging equipment yet introduced.

See Car Bulletin — —

The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio

New York: 120 Broadway



If you could draw a picture of comparative reactive pressures

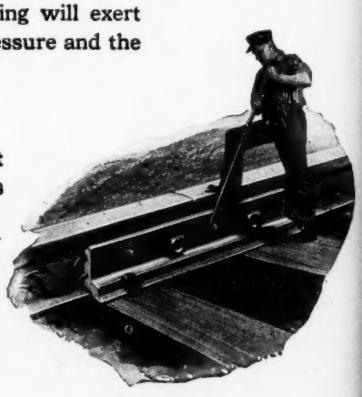
in the form of workmen prying with lining bars against rail joint nuts so that the sizes of the workmen would indicate the comparative reaction of rail joint springs and nut-locks—

Then this would represent the 40,000 pounds (twenty tons) reaction of the Verona Rail Joint Spring when fully compressed.

While this would represent the 3,000 pounds reaction of the ordinary nut lock, fully compressed.

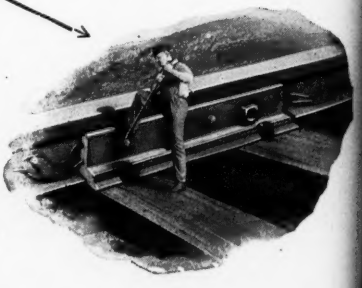
But mechanical wear and bolt stretch take place in all joints. Should such wear or stretch develop to 1/32 of an inch, the Verona Rail Joint Spring will exert 30,000 pounds (fifteen tons) reactive pressure and the joint will still be tight.

While the reaction of the nut lock at this point is less than 1,000 pounds and the joint is loose.



And when the looseness has developed to 1/16 of an inch, the Verona Rail Joint Spring still exerts over 20,000 pounds reactive pressure ***(more than six times that of an ordinary nut lock fully compressed)***.

But with a looseness of 1/16 of an inch in the joint, the reactive pressure of the nut lock is negligible.



Greater reactive pressure operating thru a greater distance—that is the secret of the success of the Verona Rail Joint Spring.

Verona Tool Works

Pittsburgh—New York—Chicago